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United States  
Department  
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Forest Service

Intermountain  
Research Station

Resource Bulletin  
INT-81

September 1993



CAT/57

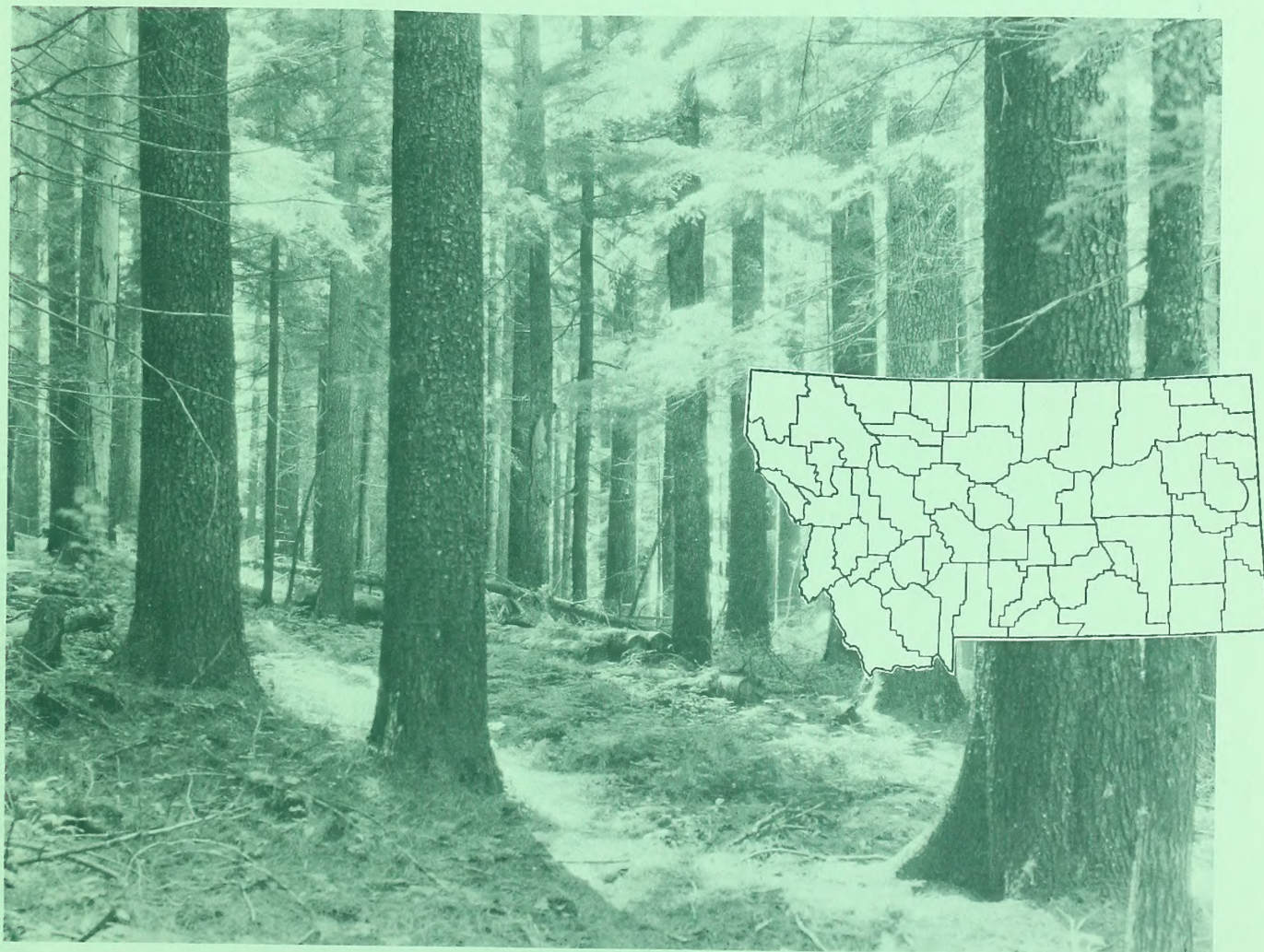
# Montana's Forest Resources

Roger C. Conner  
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## RESEARCH SUMMARY

Montana has about 22.5 million acres of forest land, almost all of it timberland. Three-fifths of the forest land is administered by the National Forests. The estimated volume of wood on timberland is almost 31.6 billion cubic feet. Net annual growth in 1988 was just under 658.0 million cubic feet. This report highlights additional resource information including total land area, timberland area, volume, growth, mortality, and removals.

## PREFACE

The mission of the Forest Service's Forest Inventory and Analysis program is to improve the understanding and management of our Nation's forests by maintaining a comprehensive inventory of the status and trends of the country's diverse forest ecosystems, their use, and their health. The McSweeney-McNary Act of 1928 initially authorized what was then known as the Forest Survey. The current legislative mandate is the Renewable Resources Research Act of 1978.

The Interior West Resource Inventory, Monitoring, and Evaluation Program, headquartered at the Intermountain Research Station, Ogden, UT, administers the Forest Inventory and Analysis activities for the Interior West States of Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, and Wyoming. These inventories provide information on the extent and condition of the forests—their wood volume, wood growth, removals, and mortality for most forest lands outside the National Forest System. These data, when combined with similar information on National Forest lands, provide a basis for forest policies and programs for the orderly development and use of renewable resources.

## ACKNOWLEDGMENTS

The Intermountain Research Station gratefully acknowledges the cooperation of the Montana Department of State Lands, Forestry Division; the Bureaus of Land Management and Indian Affairs, U.S. Department of the Interior; and the Northern Region of the Forest Service, U.S. Department of Agriculture. We extend a special note of thanks to Gary Brown, Montana State Forester, and his staff; and to the private landowners who provided information and access to field sample locations.



## HIGHLIGHTS

### Area

- The total land area of Montana is over 93.4 million acres. More than 22.5 million acres are forested.
- About 22.4 million acres are classified as timberland, including 3.4 million acres reserved from harvest.
- Nearly 11.4 million acres of the nonreserved timberland are administered by the National Forests.
- Sawtimber stands dominate nonreserved timberland; 69 percent of the area is in this stand-size class.
- Douglas-fir is the predominant forest type, occupying 6.4 million acres.

### Volume

- Timberland net growing-stock volume is almost 31.6 billion cubic feet. Net sawtimber volume is estimated to be nearly 91.0 billion board feet (Scribner rule).
- Roughly 69 percent of the net sawtimber volume is on National Forest land; another 17 percent is on nonindustrial private land.
- The Douglas-fir forest type accounts for 35.5 billion board feet—39 percent—of the net sawtimber volume.

- Nearly 56 percent of the net growing-stock volume is in trees 11.0 inches diameter at breast height (d.b.h.) and larger.

### Growth and Mortality

- Net annual growth of growing stock on timberland was 658.0 million cubic feet in 1988, an average of just 35 cubic feet per acre per year.
- Annual mortality totaled 199.4 million cubic feet in 1988. About 63 percent of the growing-stock mortality was on National Forest land.
- The lodgepole pine forest type accounted for about 76.6 million cubic feet of the annual mortality.

### Removals

- More than 249.7 million cubic feet of growing-stock volume was harvested in 1988; one-third of the volume came from forest industry land.
- Sawlogs were the primary product harvested, accounting for 70 percent of the industrial roundwood volume.
- Douglas-fir accounted for 330.7 million board feet (Scribner rule) of the sawtimber removals.



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# Montana's Forest Resources

Roger C. Conner  
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## INTRODUCTION

Before 1989, the few sources of forest resource data available for Montana had at least one characteristic in common: they were incomplete. Resource estimates presented in the earliest reports (Hutchison and Kemp 1952; Pissot and Hanson 1963) primarily were based on inventories of timberland west of the Continental Divide. They provided little, if any, information about the forest resource in the eastern two-thirds of the State.

A third inventory of Montana's forests, completed in 1980, was the first attempt at a statewide assessment. Forest land in western Montana was reinventoried, and additional field sample locations were established on forest land in the eastern two-thirds of the State. The results of this survey were reported by Green and others in 1985. The 1980 inventory was more extensive in its coverage of Montana's forest land, but it, too, fell short of a complete evaluation of the State's forest resource. Data for 5.2 million acres of Indian Trust lands were lacking, as were data for some 2.9 million acres of land in western Montana administered by the Bureau of Land Management (BLM), U.S. Department of the Interior.

The fourth and most comprehensive assessment of forest land in Montana was completed in 1989. This inventory filled data gaps left by earlier efforts and also provided remeasurement data for a portion of the State.

The 1989 inventory of Montana's forest land provided area, volume, growth, and mortality estimates for timberland outside the National Forests. Similar statistics for National Forest System (NFS) lands were taken from the Resources Planning Act (RPA) National data base (USDA, RPA). Reserved areas, such as wilderness, are not field sampled, but they are included in the total area summaries (appendix II, table 9).

Although the 1980 and 1989 inventories of Montana are similar in scope, they differ somewhat in sampling design and intensity, in land classifications, and in standards and definitions. This makes direct comparisons ill-advised, if not impossible. However, some general comparisons are possible where differences between the two inventories can be reconciled or are considered minimal.

## BACKGROUND

The first permanent Euro-American settlement, established at Stevensville in 1841, had the earliest known "sawmill" in Montana. However, it would be another 20 years before a viable timber industry had begun to develop in the State.

Explorers and trappers were the first persons other than Native Americans to journey into the territory. These mountain men, who often traveled alone, required little more than they could carry to sustain them. Aside from firewood, and logs for cabins, trading-posts, and a few forts, these early years in Montana's history produced few demands on the State's abundant timber resource.



Mining for metals, particularly gold and silver, brought the first rush of settlers into the area, and with them the first real demands for lumber and other milled products. From about 1862 to 1876, roughly 500 mining camps were in operation in Montana, reportedly producing over \$90 million in gold (Montana Department of Natural Resources and Conservation 1987). At the peak of this placer-mining era, millions of lineal feet of rough-sawn lumber were used to build sluices and flumes and to construct the shantytowns in which the miners lived.

The advent of hard-rock mining placed an even greater demand on the forest resource. Tons of wood were needed daily to fire smelter furnaces used to separate gold, silver, copper, and other valuable metals from the ore. By the mid-1880's, many once-forested hills and mountainsides had been stripped for fuelwood. Fortunately, the majority of those areas have since been reforested.

The rising demand for lumber and other wood products gave rise to many pioneer sawmills, marking the beginning of the State's timber industry. Anton M. Holter set up one of the first of these rather crude mills in 1864 near Last Chance Gulch (now Helena). A number of small sawmills were operating by the late 1860's, producing about 13 million board feet of lumber in 1869 (Hutchison and Kemp 1952).

The ensuing 120 years have witnessed the growth of the State's timber industry. In 1988 it employed 11,690 workers and produced 1.6 billion board feet of lumber (Keegan and others 1989). Small sawmills have been losing ground to larger mills since around 1890. The State's 16 large sawmills—those producing more than 10 million board feet annually—accounted for 96 percent of the lumber production in 1988.

## THE FOREST RESOURCE

Montana has 22.5 million acres of forest land, about one-fourth of the State's total area. Most of this forest area is situated west of the Continental Divide due, in part, to the abundance of moisture brought in on airmasses from the Pacific Coast. The diversity of tree species reflects the influence of this coastal airflow. Western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*) are examples of coastal species found in western Montana.

Forest lands east of the Divide are influenced by continental climatic conditions. In general terms, that means they are drier. In contrast to the mountains of western Montana, much of the eastern two-thirds of the State is characterized by broad plains and low, rolling hills. Plentiful moisture and diverse topography generally give rise to a variety of forest types and conditions, as in western Montana. However, if moisture is scarce, or the terrain is unvaried, one or two forest types may predominate, as is the case for eastern Montana.

Ponderosa pine stands predominate on almost three-fourths of the area of forest land outside the National Forests east of the Continental Divide (O'Brien and Conner 1991). However, ponderosa gives way to Douglas-fir and lodgepole pine forest types at the higher elevations in southwestern Montana (Chojnacky and Brown 1991), where moisture is more available.

Although Montana's forest land is predominantly timberland, the eastern half of the State has a few thousand acres of woodland. For land outside the National Forest System (NFS), woodland is defined as forest land



where timber species make up less than 10 percent of the stocking. Woodland sites typically are very dry and rocky, and have extremely low productivity.

Most of the 92,000 acres of woodland outside NFS in Montana is occupied by Rocky Mountain juniper (*Juniperus scopulorum*):

Woodland forest type	Acres
Juniper	89,096
Other	1,464
Total	90,560

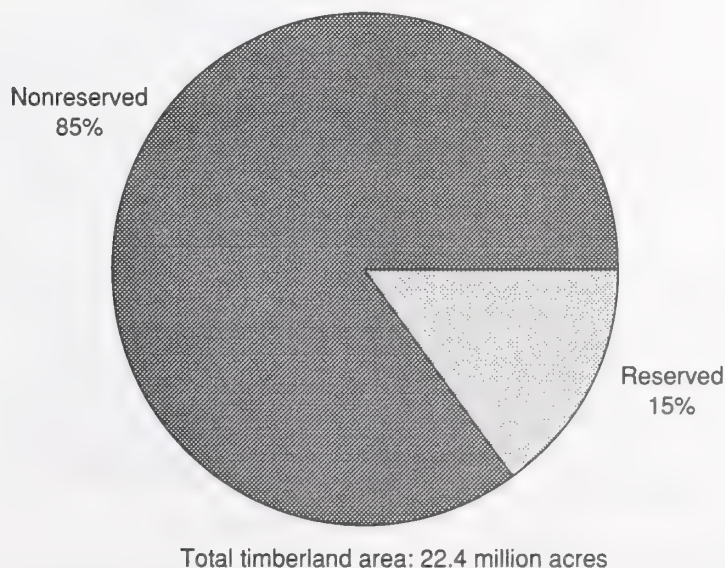
Other woodland includes stands of Rocky Mountain maple (*Acer glabrum*) and curlleaf mountain-mahogany (*Cercocarpus ledifolius*). Roughly 65 percent of the woodland area is privately owned.

Woodland is not classified separately on National Forest land in Montana. Sites where juniper is the predominant tree species are included in a miscellaneous western softwoods category. This category also includes nonstocked areas (appendix II, table 10).

Woodland acres are considered of nominal value from a timber perspective, but do provide valuable wildlife habitat. Because woodland accounts for so little of Montana's forest land, the rest of this report will focus on timberland.

## MONTANA'S TIMBERLAND

Montana has an estimated 22.4 million acres of timberland, including over 3.4 million acres that is reserved and unavailable for the harvest of wood products. Reserved areas account for 15 percent of Montana's timberland (fig. 1) and encompass about 1.5 million acres more in 1989 than in 1974 (Schweitzer and others 1975). Reserved lands (appendix IV) have been set aside as National Forest Wilderness Areas, National Parks and Monuments, or other areas. They are prized for their unique natural beauty, recreational value, or historic importance.



**Figure 1**—Distribution of timberland area by land class, Montana, 1989.

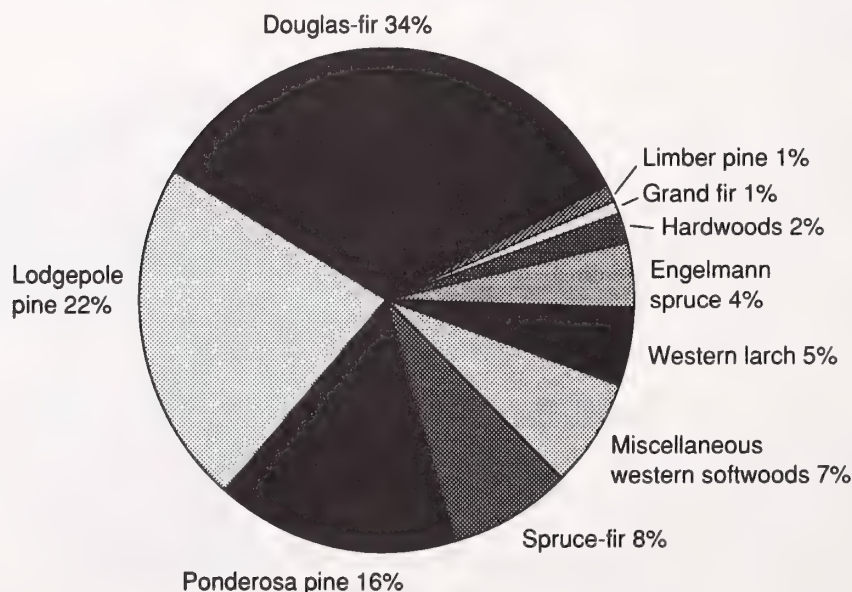


Area estimates for reserved land are provided by the managing agency. These areas were not field sampled. Therefore, associated resource estimates such as timber volume and growth are unavailable. The following statistics and discussion pertain only to the nearly 19.0 million acres of nonreserved timberland.

## Forest Types and Ownership

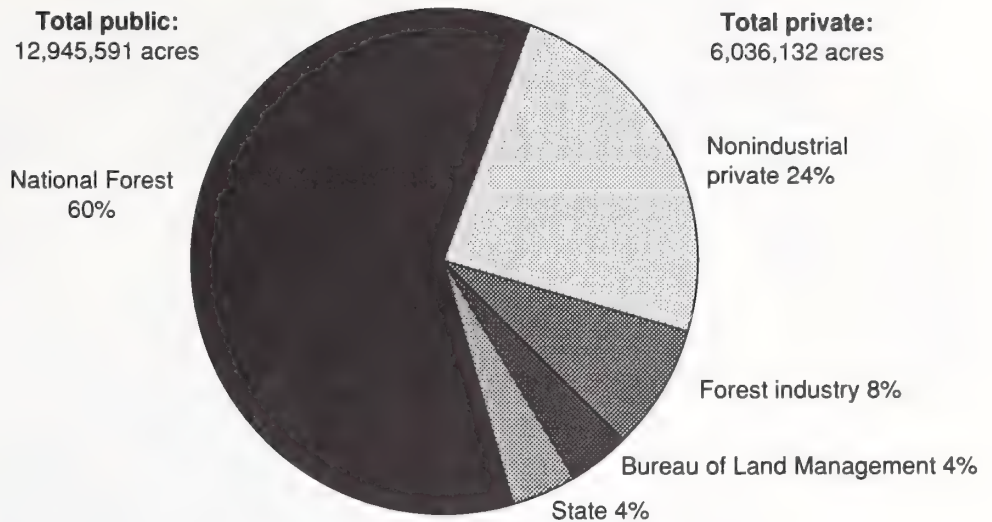
The distribution of Montana's nonreserved timberland by principal forest type is shown in figure 2. Conifers occupy about 98 percent of the area, with Douglas-fir the predominant type. Douglas-fir, lodgepole pine, and ponderosa pine forest types total over 13.5 million acres and play a major role in Montana's timber industry. Spruce-fir accounts for 8 percent of the timberland area, and Engelmann spruce occupies another 4 percent. The spruce-fir forest type, composed of Engelmann spruce (*Picea engelmannii*) mixed with subalpine fir (*Abies lasiocarpa*), often occurs on remote, high-elevation sites. Engelmann spruce is the more desirable commercial species. However, it is often found in riparian areas, which may reduce its availability for harvest. Recognition of the susceptibility of riparian areas to damage from logging has reduced harvesting in these areas on public land (Keegan and others 1989). Almost 78 percent of the spruce-fir and spruce forest types occur within the National Forests.

The management and potential availability of Montana's timber resource is largely dictated by the individual, corporation, or agency owning or managing the land. Nonreserved timberland is roughly two-thirds publicly owned and one-third privately owned. Nearly 11.4 million acres of timberland, or 60 percent of the timberland area (fig. 3), is administered by the 10 National Forests in Montana (appendix III). This estimate of National Forest timberland includes lands forest plans classify as unsuitable for timber production, as well as lands classified as suitable. The remainder of the timberland in public ownership is managed by the State of Montana or by the BLM. Each oversees about 4 percent of the timberland area.



**Figure 2**—Distribution of nonreserved timberland area by forest type, Montana, 1989. (All other forest types combined account for less than 1 percent.)





**Figure 3**—Distribution of nonreserved timberland area by ownership class, Montana, 1989. (The Bureau of Land Management ownership class includes 90,064 acres of miscellaneous Federal and 6,034 acres of county and municipal timberland.)

Over 6.0 million acres of timberland are privately owned. Nonindustrial private landowners control over 4.4 million acres, 73 percent of the privately owned timberland, and 23 percent of the total area of nonreserved timberland. Most of the nonindustrial private timberland is owned by farmers and ranchers, but some 671,506 acres of nonreserved timberland is found on Indian reservation lands administered through the Bureau of Indian Affairs, U.S. Department of the Interior (appendix III, table 9).

The remaining 1.6 million acres of private timberland is classified as forest industry. Industry lands are owned by individuals or companies operating primary wood processing plants. Generally, these lands are managed for the production of wood directly supplying the owners' plants and mills.

## Stand Composition and Stocking

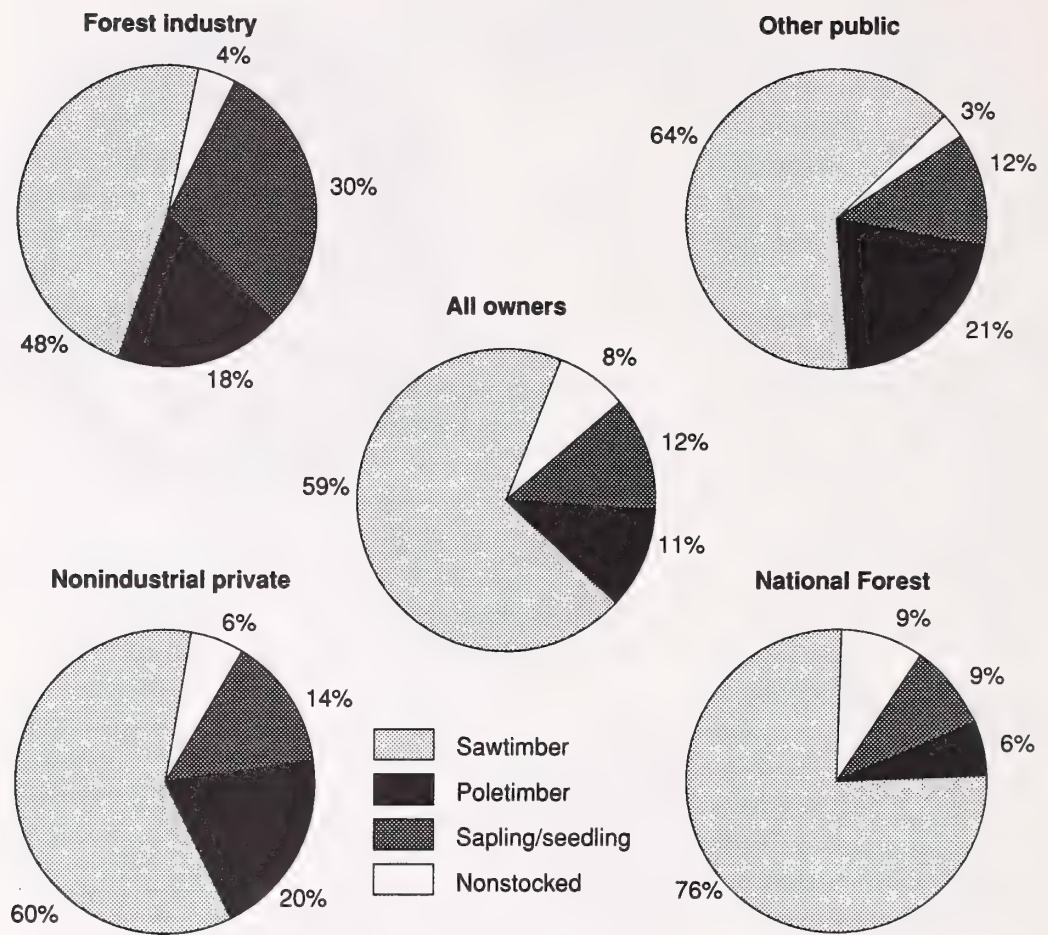
Knowledge of the composition and stocking condition of Montana's timber stands is essential to understanding their management needs. The composition of a stand is partly defined by the distribution of its trees by size and species. Identifying a stand as Douglas-fir (*Pseudotsuga menziesii* var. *glauca*) sawtimber or pole-sized lodgepole pine (*Pinus contorta*) can indicate its potential to provide timber products, such as sawlogs or pulpwood.

### STAND-SIZE CLASS

Montana's timberland is predominantly a sawtimber resource. Just over 13.0 million acres, or 69 percent of Montana's timberland (fig. 4), has a plurality of basal area stocking in sawtimber-size trees. Another 11 percent of the timberland area is stocked with poletimber, while saplings and seedlings are predominant on about 12 percent of the State's timberland. A relatively small portion of the total area is nonstocked, representing more than 1.4 million acres of timberland that currently contributes little, if anything, to timber inventory.

Figure 4 shows the potential source of much of the State's sawtimber. More than three-fourths of all timberland acres within the National Forests—over 8.6 million acres—are classified as sawtimber. This compares to





**Figure 4**—Distribution of nonreserved timberland area by stand-size class and owner group, Montana, 1989.

64 percent of the other public and 60 percent of the nonindustrial private timberlands. Less than half of the forest industry acres currently support stands of sawtimber trees. This is likely due to the higher rates of sawtimber harvest on industry lands. About 300,000 acres of forest industry timberland currently supports stands of poletimber. A portion of these stands could reach sawtimber size within a reasonably short period of time.

The Douglas-fir forest type accounts for 38 percent of the area of sawtimber—about 4.9 million acres. Lodgepole pine and ponderosa pine make up an additional 24 percent and 15 percent, respectively. These three forest types also account for about 73 percent of the poletimber stands.

In many cases, stand-size class accurately describes the relative tree size dominating a given acre of timberland. A uniform, even-aged, single-species stand, for instance, is well represented by its stand-size descriptor. But many stands are not uniform in structure. Such stands may include several species and a full range of tree diameters. Since stand-size class is based solely on the plurality of basal area, the class assigned to a particular acre can be misleading. To better describe these stands, the acres within each stand-size class were arrayed by board-foot volume classes (table 1). The mature stand-size class was added to provide an estimate of the acres of sawtimber stocked with trees more than 100 years old.



**Table 1**—Area of nonreserved timberland outside the National Forests by stand-size class and stand volume, Montana, 1989

Stand-size class	Stand volume class (board feet per acre, Scribner rule)					Total
	<1,500	1,500-4,999	5,000-9,999	10,000-19,999	≥20,000	
	<i>Acres</i>					
Mature	148,050	609,807	383,589	369,268	46,543	1,557,257
Sawtimber	549,114	1,349,257	697,092	276,145	15,706	2,887,314
Poletimber	815,195	587,394	98,673	8,880	—	1,510,142
Sapling/seedling	1,035,142	237,214	6,475	—	—	1,278,831
Nonstocked	391,739	—	—	—	—	391,739
Total	2,939,240	2,783,672	1,185,829	654,293	62,249	7,625,283

The distribution of the acres in each stand-size class by stand volume presents a more detailed, and perhaps more accurate, description of Montana's timber resource. Almost 16 percent—697,164 acres—of the combined mature and sawtimber stands have less than 1,500 board feet (Scribner rule) of sawtimber per acre, and another 44 percent—1.9 million acres—support between 1,500 and 5,000 board feet. Only 1 percent contains 20,000 or more board feet of sawtimber volume per acre. Stands classified as poletimber also support substantial board-foot volume. Over 107,000 acres contain 5,000 board feet or more per acre. Even 243,689 acres in the sapling/seedling class has at least 1,500 board feet of volume per acre. Thus, as shown by board-foot volume, the acres within an individual stand-size class can encompass a wide range of stand structures.

### STOCKING CONDITION

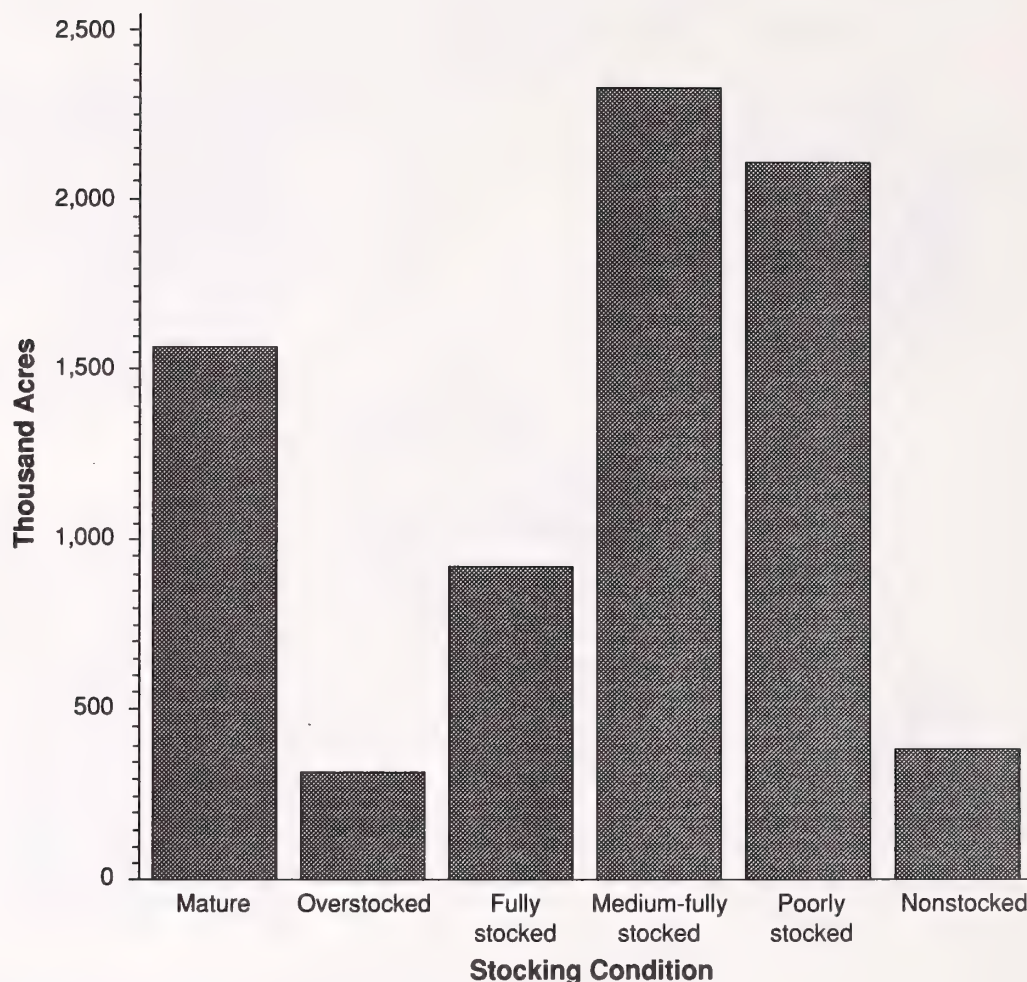
While stand-size class indicates the predominant size of the trees in a stand, stocking condition reflects the degree to which growing-stock trees are utilizing the site. Figure 5 gives the distribution of timberland acres by stocking condition for lands outside the National Forests. National Forest lands included over 1.0 million acres of nonstocked lands or lands identified in forest plans as unsuitable for timber management. No other information was available for stocking condition in the National Forests.

An estimated 3.3 million acres of timberland outside NFS are fully stocked, or are medium-to-fully stocked with growing-stock trees. Another 314,434 acres are overstocked and are in need of thinning or harvest. Lodgepole pine accounts for more than half of the overstocked timberland acres.

One-fifth of the area, or about 1.6 million acres, supports mature stands where trees more than 100 years old make up the majority of the stocking. Douglas-fir accounts for nearly half the mature timber. Mature stands tend to grow more slowly and become more susceptible to insect and disease mortality with advancing age. If the dead material is not harvested, it can substantially increase the risk and severity of forest fire. Such a condition existed in and around Yellowstone National Park before the fires of 1988.

One-third of the timberland area outside NFS, over 2.5 million acres, are poorly stocked or nonstocked. Ponderosa pine accounts for 43 percent of the poorly stocked acres and nearly 62 percent of the nonstocked acres.





**Figure 5**—Distribution of nonreserved timberland area outside the National Forests by stocking condition, Montana, 1989.

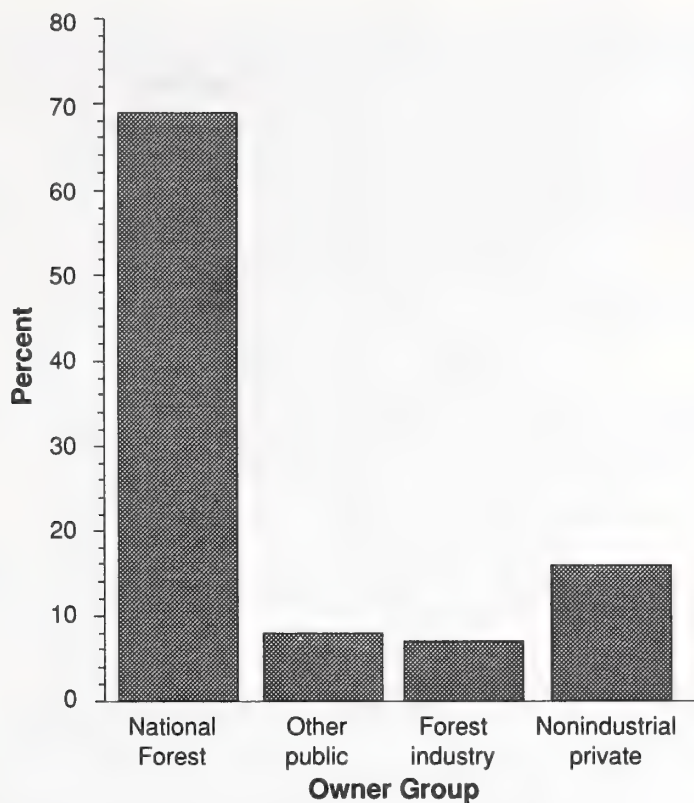
## Volume

Net growing-stock volume on Montana's timberland was estimated to be almost 31.6 billion cubic feet in 1989, with all but 2 percent in softwood trees. Net sawtimber volume amounted to over 90.9 billion board feet (Scribner rule). Over half of the sawtimber volume is in trees less than 15 inches diameter at breast height (d.b.h.), and 74 percent is in trees less than 19 inches d.b.h.

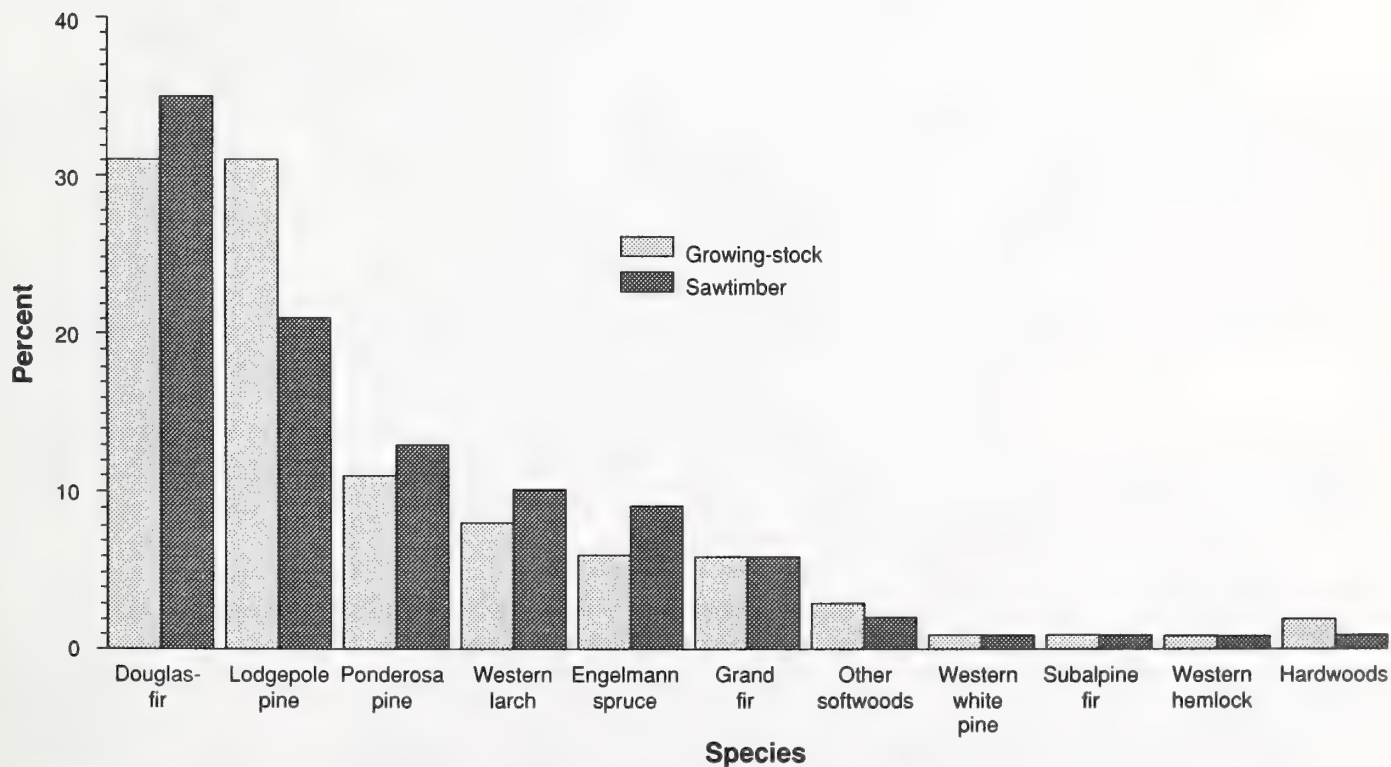
The distribution of the timberland volume by owner group closely approximates the distribution of area. The National Forests have 60 percent of the timberland area and 69 percent (fig. 6) of the sawtimber volume—about 62.3 billion board feet. Nonindustrial private timberland accounts for roughly 16 percent of the sawtimber volume on about one-quarter of the timberland area. Forest industry timberland, which supplies much of the annual timber harvest in Montana, has 7 percent—6.4 billion board feet—of the sawtimber volume on its 8 percent share of the timberland acres.

Douglas-fir, a component of nearly all forest types in Montana, accounts for over one-third of the sawtimber and 31 percent of the growing-stock volume (fig. 7). Lodgepole pine makes up 31 percent of the growing-stock volume, but only 21 percent of the volume of sawtimber. This reflects the tendency of lodgepole to form dense stands of relatively small trees.





**Figure 6**—Distribution of net sawtimber volume on nonreserved timberland by owner group, Montana, 1989.



**Figure 7**—Distribution of net growing-stock and sawtimber volumes on nonreserved timberland by species, Montana, 1989. (All other species combined account for less than 1 percent.)



Ponderosa pine (*Pinus ponderosa*), an important source of sawlogs for eastern Montana mills, accounts for roughly 13 percent of the total sawtimber volume. Over 4.8 billion board feet—56 percent—of the ponderosa pine sawtimber volume is on nonindustrial private timberland.

The bulk of the sawtimber volume on timberland outside NFS is found in the timber-rich northwestern region of the State. Timberland in Lincoln, Lake, Flathead, Sanders, and Missoula Counties supports over 12.5 billion board feet of sawtimber volume, nearly 44 percent of the board-foot volume on land outside NFS and 14 percent of the sawtimber volume on all timberland.

## Productivity

For timberland outside NFS, productivity estimates the potential of a timberland site to grow wood based on stand-level yield capability equations (Brickell 1970). This potential is most often expressed in cubic feet of growth per acre per year at culmination of mean annual increment in fully stocked natural stands. Timberland sites differ in their ability to grow trees, and productivity classes quantify these differences. The classes serve as guidelines to identify sites best suited for the production of timber products.

On average, timberland in the Rocky Mountain States is moderately productive (Green and Van Hooser 1983). Montana's timberland is no exception. Less than 3.0 million acres of the State's timberland has the potential to grow more than 85 cubic feet of wood per acre annually. Nearly three-fourths of the timberland area—13.9 million acres—has the potential to produce from 20 cubic feet to about 84 cubic feet per acre per year.

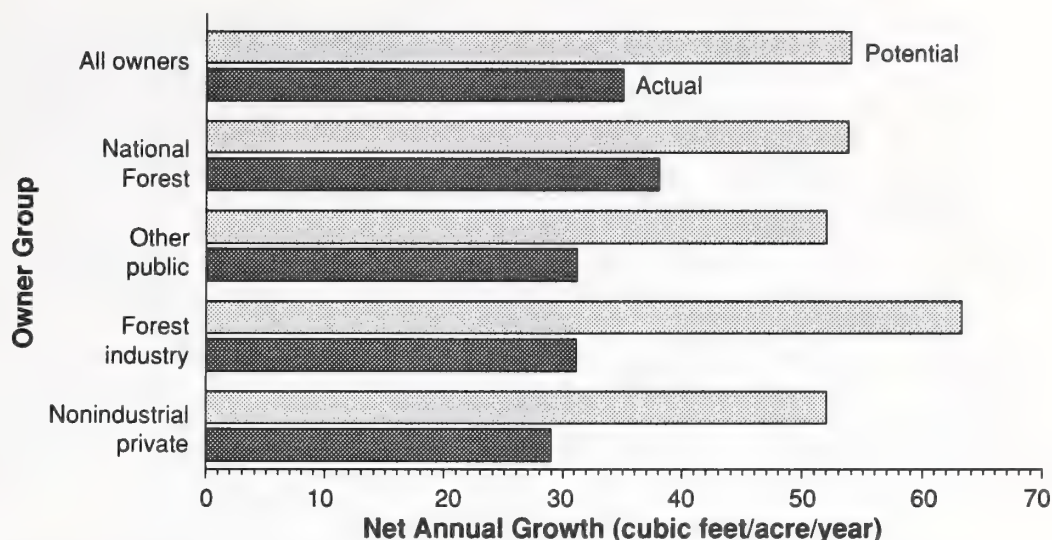
The average productive potential of Montana's timberland acres, as well as current average net growth, varies widely throughout the State. This is illustrated by comparing average potential and actual net growth on Montana's timberland outside NFS by geographic region:

Geographic region	Potential growth - - - Cubic feet per acre per year - - -	Average net growth (1988)
Northwestern	73	41
Western	64	42
Southwestern	48	34
West-central	48	28
Eastern	42	20

The influence of the Continental Divide is apparent. Average potential productivity and actual net growth are higher in the western and northwestern regions of Montana. This is partly due to the greater annual rainfall west of the Divide. In the eastern half of Montana, timberland net annual growth averaged just 20 cubic feet per acre in 1988, less than half the comparatively low productive potential of timberland in this region. Counties comprising each geographic region (sample area) are shown in figure 18, appendix I.

The average growth potential for all timberland statewide was estimated to be about 54 cubic feet of wood per acre per year (fig. 8). Net annual growth averaged just 35 cubic feet per acre in 1988, or about 64 percent of potential. Nonindustrial private timberland has the capacity to produce an estimated 52 cubic feet per acre annually. However, actual net growth on these acres averaged about 29 cubic feet in 1988, or 56 percent of potential. Forest industry timberland acres have the highest average productive potential—an estimated 63 cubic feet per acre per year—but currently are





**Figure 8**—Potential productivity and actual net annual growth on nonreserved timberland by owner group, Montana, 1988.

producing an average of just 31 cubic feet, 49 percent of potential. Net growth was low in 1988 due, in part, to the significant area that is currently nonstocked and to relatively high mortality.

Efforts to bring all nonstocked areas back into production could add a substantial volume of wood to Montana's timberland. If all nonstocked acres were producing at just half their respective potential, an additional 43.0 million cubic feet of wood could be produced annually, based on 1988 net growth estimates. This additional volume would help offset almost 22 percent of the growing-stock volume lost to mortality.

## Components of Change

Natural forces and human activities are responsible for changes in Montana's timber resource. Growth and mortality reflect the changes brought about by natural forces. Insects and disease are among the natural agents causing mortality. Fire—or its absence—also helps to define the character of the forest. Change due to human activity is most apparent from harvesting trees, particularly clearcutting. Combining current estimates of removals through harvesting with estimates of growth and mortality provides a good approximation of the level of changes affecting the timber resource.

### GROWTH AND MORTALITY

Total growth on Montana's timberland was estimated to be 857.4 million cubic feet in 1988, equivalent to an average increase of about 45 cubic feet of wood per acre. However, losses due to mortality totaled more than 199.4 million cubic feet that year, leaving a net increase to inventory of 658.0 million cubic feet. The 1988 net growth equates to an annual 2.1 percent increase in timberland growing-stock volume. Douglas-fir accounted for over one-third of the total net cubic-foot growth, and one-quarter of the total mortality on all timberlands. Net annual growth of sawtimber on timberland outside NFS amounted to almost 807.8 million board feet (Scribner rule) after deducting over 181.7 million board feet of mortality.

Mortality is natural, but it is also costly. The volume in one large sawtimber tree lost to mortality can negate the annual growth on several

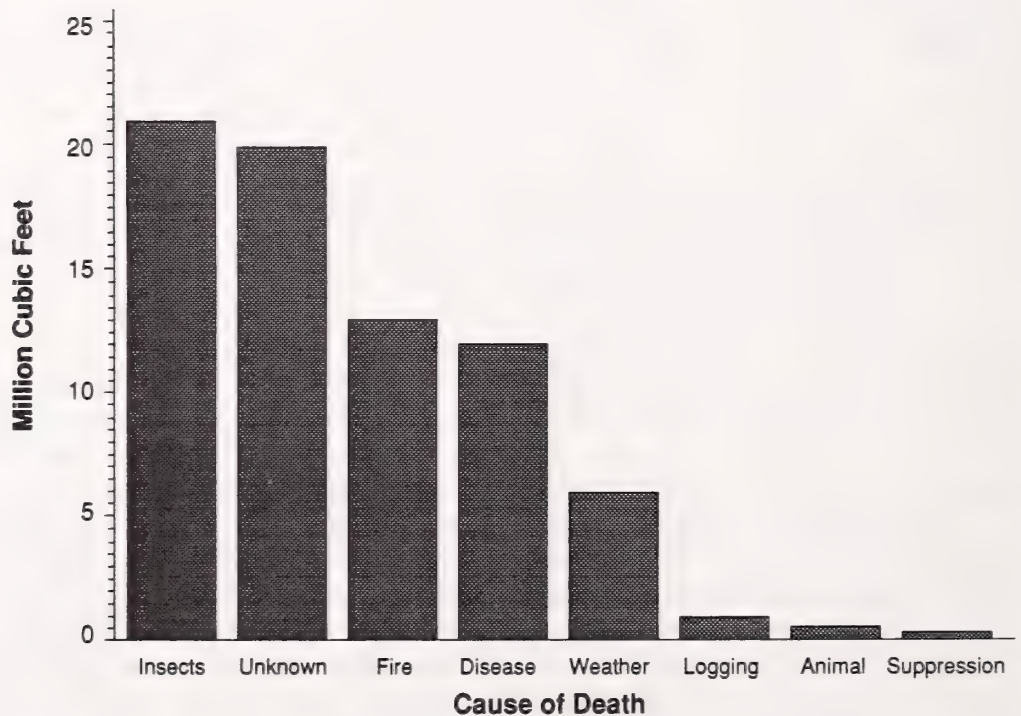


acres. Such losses add up quickly. The 24.3 million cubic feet of mortality on forest industry lands nullified the growth on almost 528,000 acres, assuming each acre was producing at the current average of 46 cubic feet of total growth per year. In 1988, one-third of the total growth on industry lands was lost to mortality, as was one-fifth of the total growth on nonindustrial private timberland:

Owner group	Annual mortality <i>Million cubic feet</i>	Percent of total growth
National Forest	125.5	23
Other public		
State	10.5	28
Other	6.4	22
Forest industry	24.3	33
Nonindustrial private	32.7	20

Specific causes for tree mortality are difficult to determine. This is reflected by the nearly 20 million cubic feet of mortality on timberland outside NFS lost to unknown causes and by the rather general classes into which the remaining causes of mortality are classified (fig. 9). Insects and disease are always present in forest stands. At times, they can severely damage the timber resource. In 1988 they were credited with the loss of 33.6 million cubic feet of volume on timberland outside NFS, nearly 17 percent of the total mortality on all timberland.

Fire destroyed 13.0 million cubic feet of growing-stock volume on timberland outside NFS in 1988, one of the worst fire years in recent history. Although fire's evidence may no longer be visible, every acre is likely to have



**Figure 9**—Distribution of annual mortality of growing stock on nonreserved timberland outside the National Forests by cause of death, Montana, 1988.



**Table 2**—Area of nonreserved timberland outside the National Forests by owner group and burn history, Montana, 1989

Owner group	Burn history					Total
	Past year	1-3 years	3-10 years	More than 10 years	No evidence	
----- Acres -----						
Nonindustrial private Forest	22,868	81,385	255,890	1,379,127	2,693,499	4,432,769
industry	4,460	40,758	261,106	562,697	734,342	1,603,363
State	—	7,015	26,016	329,022	401,356	763,410
Other public	4,320	1,215	20,505	277,181	522,519	825,740
Total	31,648	130,373	563,517	2,548,027	4,351,716	7,625,281

burned to some degree in the past. Table 2 gives estimates of recent fire activity on timberland outside NFS. About 3.3 million acres showed evidence of having been burned. Not all of these acres burned as a result of wildfire, nor did every fire result in lost volume. Nonetheless, it is probable that most, if not all, of the reported fire mortality occurred on a portion of the 726,000 acres presumed to have been burned within the last 10 years. Over half of the area with evidence of recent fires was nonindustrial private forest land.

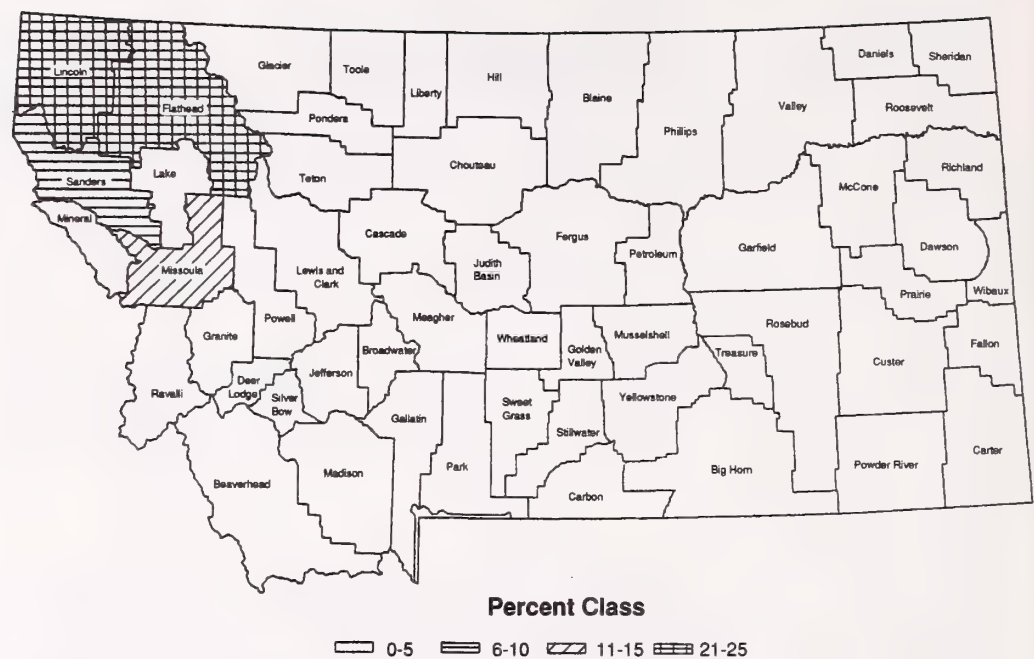
Tree mortality is natural as forest stands develop. Though some of 1988's estimated mortality will be salvaged, much more of the dead wood certainly could be. Increased efforts to reduce losses to mortality and to salvage more of the dead material would help offset growing pressures on Montana's timber resource.

## REMOVALS

Harvesting trees is perhaps the greatest of many human impacts on Montana's forests. Total removals from growing-stock volume amounted to 249.7 million cubic feet in 1988, including 1.1 billion board feet (Scribner rule) of sawtimber (table 3). Timber products, such as sawlogs, veneer logs,

**Table 3**—Annual removals from growing stock on timberland by type of removals, Montana, 1988

Removal type	Growing-stock removals	
	Million cubic feet	Million board feet (Scribner rule)
Sawlogs	175.3	880.6
Veneer logs	38.6	194.1
Pulpwood	2.1	10.3
House logs	.9	4.4
Cedar products	.1	1.4
Other	3.7	.5
Total timber products	220.7	1,091.3
Fuelwood	1.5	7.8
Logging residue	27.5	40.2
Total removals	249.7	1,139.3



**Figure 10**—Percent distribution of sawtimber removals by county, Montana, 1988.

and pulpwood, account for 96 percent of the sawtimber removals. An estimated 48.0 million board feet of the sawtimber removals were composed of fuelwood and logging residue (McLain 1992).

As might be expected, most of the removals from Montana's timberland came from counties in the State's northwestern corner (fig. 10). Flathead, Lincoln, Lake, and Sanders Counties accounted for 58 percent of the total sawtimber removals. When Missoula and Powell Counties are included, northwestern Montana accounted for almost three-fourths of the 1988 removals volume statewide.

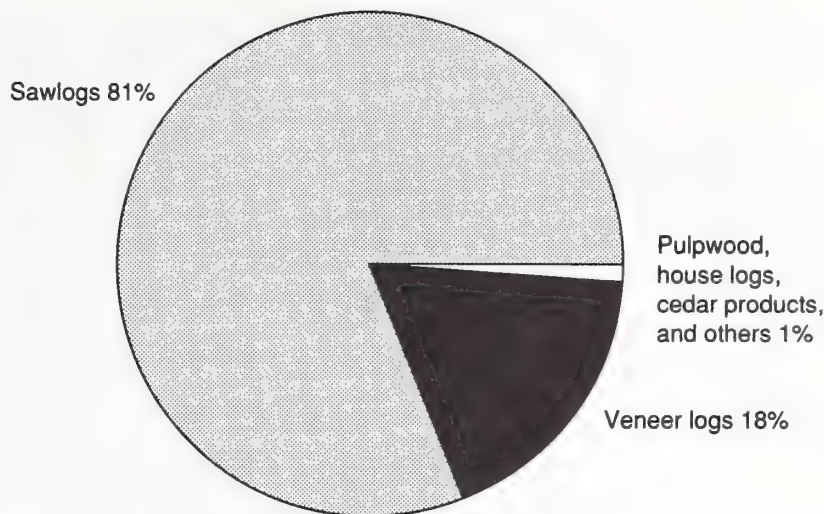
Sawlogs continue to be the primary timber product. The 880.6 million board feet (Scribner rule) of sawlog removals in 1988 was 81 percent of the timber products output (fig. 11). Veneer logs accounted for another 18 percent.

Traditionally, the National Forests have been the principal source of public timber for Montana's mills. This continues to be the case. An estimated 439.7 million board feet of sawtimber volume came from National Forest timberland. Nearly half the total sawlog production came from the National Forests (fig. 12). Most of the remaining sawlog removals came from nonindustrial private (27 percent) and forest industry (23 percent) timberland.

Lodgepole pine's share of the total timber products harvest has increased. Harvest of lodgepole went from 12 percent of the volume in 1969 to 28 percent in 1988, surpassing Douglas-fir as the predominant species harvested (Keegan and others 1989). Inventory estimates show lodgepole pine accounted for 259.1 million board feet (Scribner rule) of Montana's 1988 sawlog removals (fig. 13) and 42 percent of the fuelwood harvest (McLain 1990). Douglas-fir sawlog removals totaled about 215.7 million board feet in 1988.

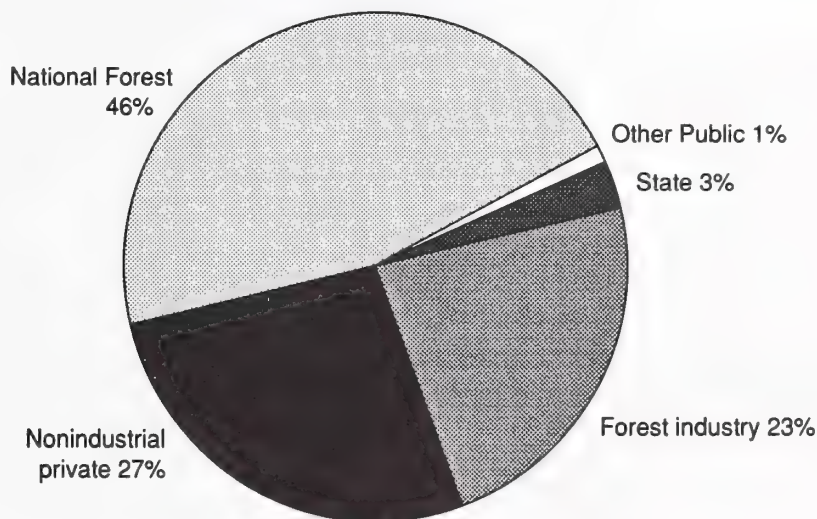
The harvest of dead lodgepole pine has also increased. Development and expansion of Montana's log home industry is partly responsible for the increased demand. This industry grew from three manufacturers in 1960 to 35 in 1988 (Keegan and others 1991). The manufacturing process utilizes





Total timber products: 1,091.3 million board feet (Scribner rule)

**Figure 11**—Distribution of timber products output by product, Montana, 1988.

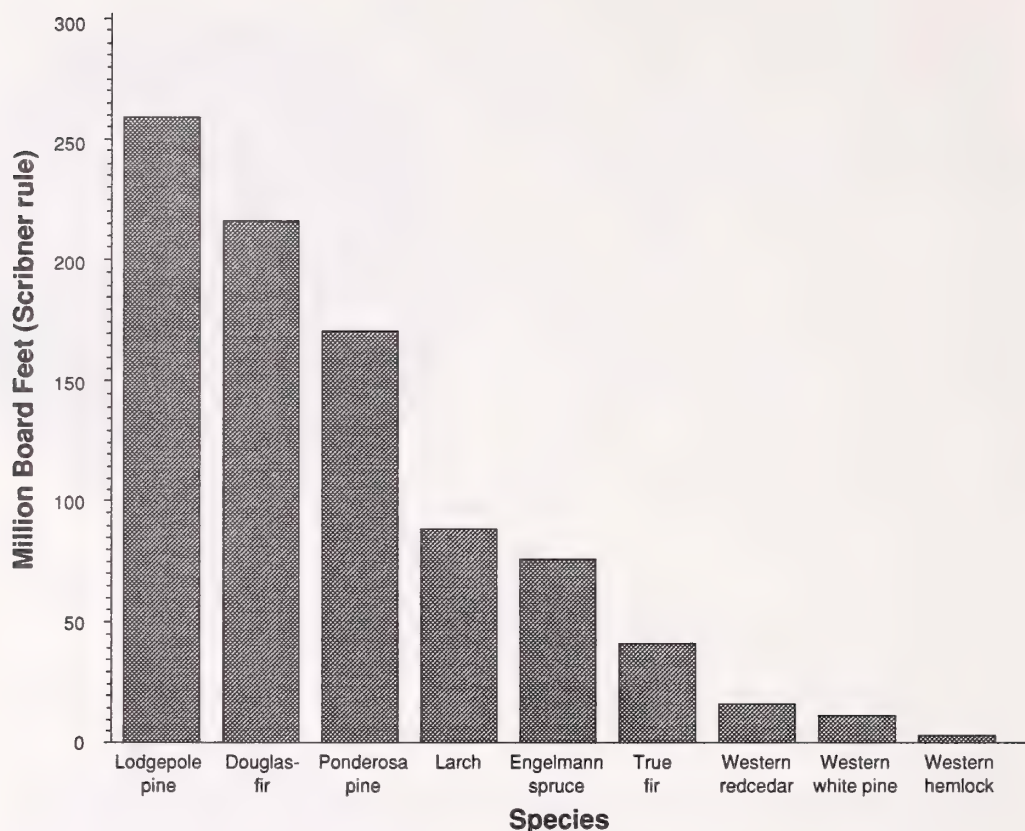


Sawlog removals: 880.6 million board feet (Scribner rule)

**Figure 12**—Distribution of sawlog removals volume by owner group, Montana, 1988.

standing dead trees between 9 and 14 inches in diameter. Almost 13.0 million board feet of volume in dead lodgepole pine sawlogs were processed into house logs in 1988, 64 percent of the total house log volume harvested that year.

Much more of the dead material on Montana's timberland could be salvaged. An estimated 411.7 million cubic feet of salvable dead volume is on timberland outside NFS. Only 36.4 million cubic feet of volume in salvable dead softwood trees was harvested from all lands in 1988 (McLain and others 1992). Over 55 percent of the wood harvested from salvable dead trees was fuelwood. Another 39 percent of the dead volume was in sawlogs.



**Figure 13**—Distribution of sawlog removals from growing stock on nonreserved timberland outside the National Forests by species, Montana, 1988. (True fir includes 501,000 board feet of whitebark and limber pine volume.)

## Net Change in Inventory

After annual mortality and removals were accounted for, total growing stock increased 408.3 million cubic feet on Montana's timberland in 1988. This represents a net increase of 1.3 percent in the State's inventory volume:

Components of change	Million cubic feet
Total growth	857.4
Mortality	- 199.4
Net growth	658.0
Removals	- 249.7
Net change	+ 408.3
Percent change in inventory	+ 1.3

The net increase indicates that Montana's growing-stock inventory is in relatively good shape. Sawlogs, however, are the most sought-after timber product. The present condition of the State's sawtimber inventory affects future timber supply. A substantial share of this current inventory is on timberland outside the National Forests.

## CHANGE IN SAWTIMBER INVENTORY BY OWNER

Annual sawtimber removals from timberland outside NFS play a prominent role in Montana's timber supply. The net change in sawtimber inventory on



these lands is an indication of the potential for continuing to harvest at current levels:

Components of change	Owner class			
	State	Other public	Forest industry	Nonindustrial private
	----- Million board feet (Scribner rule) -----			
Total growth	126.8	85.4	228.1	549.2
Mortality	-29.4	-18.3	-54.7	-79.4
Net growth	97.4	67.1	173.4	469.8
Removals	-39.1	- 8.2	-381.2	-271.1
Net change	+58.3	+58.9	-207.8	+198.7
Percent change in inventory	+ 1.3	+ 2.1	- 3.2	+ 1.3

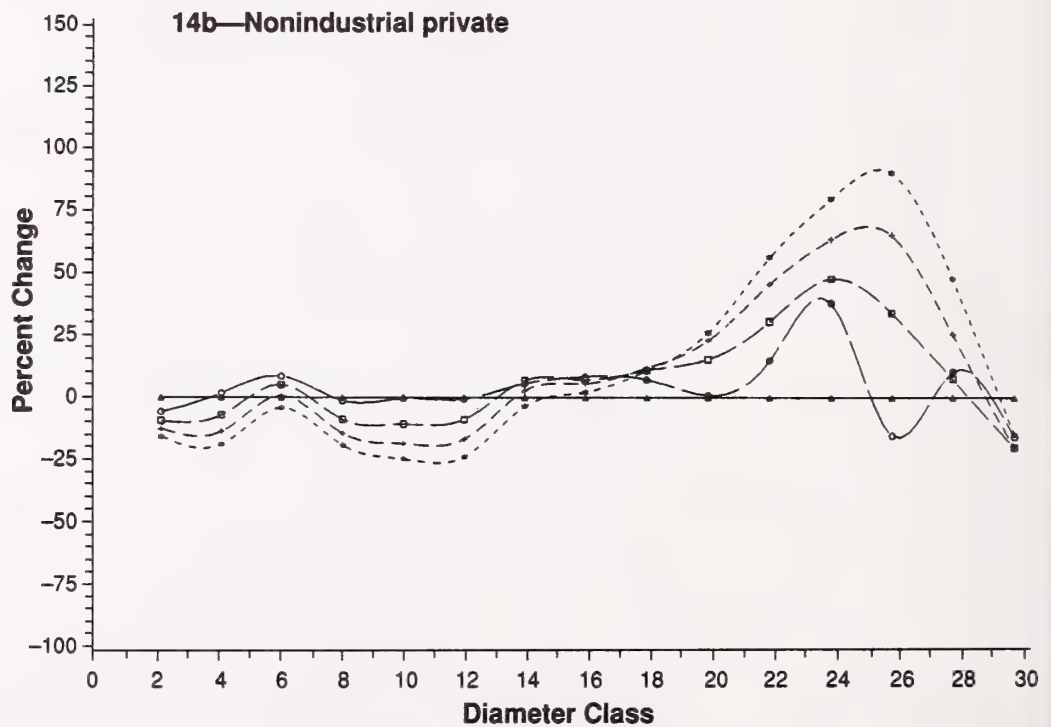
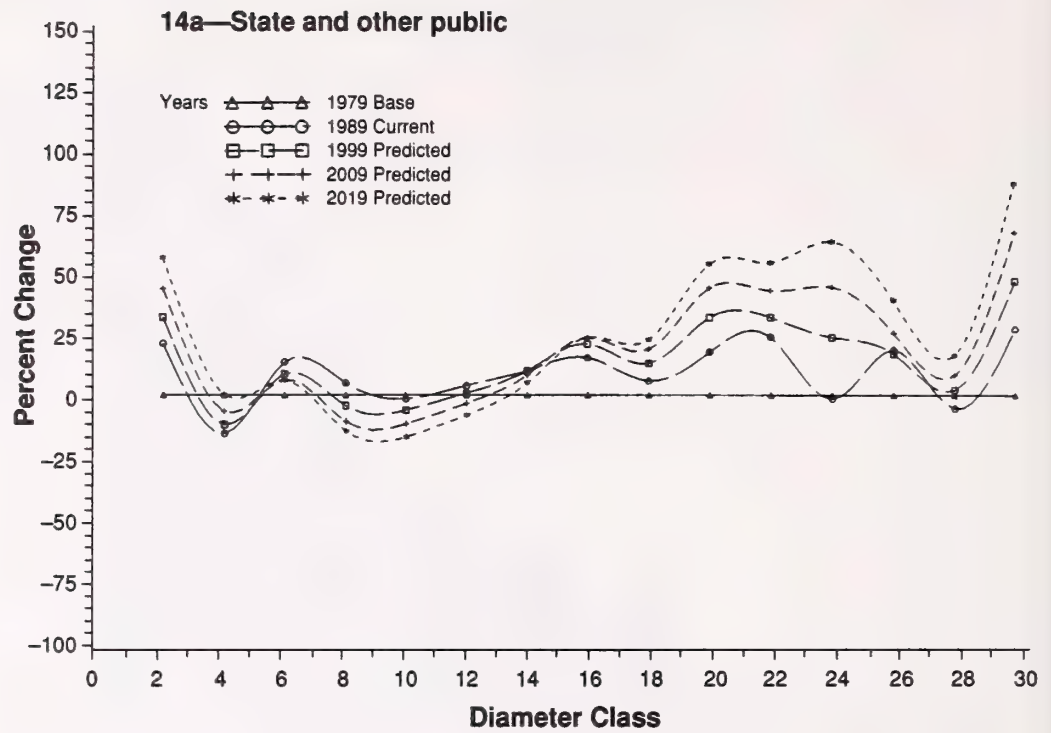
Given present levels of net growth and removals, the outlook for the sawtimber resource on State timberland and on other public timberland is somewhat promising. The same can be said of nonindustrial private timberland. Total sawtimber inventory volume on these lands is increasing, although at an average of just 1.6 percent annually. Forest industry sawtimber inventory, on the other hand, suffered a net loss.

The 1988 removals level from industry timberland was roughly 220 percent of net annual growth. The 381 million board feet of sawtimber cut from forest industry timberland and the volume lost to mortality decreased net sawtimber inventory by almost 208 million board feet—3.2 percent.

High levels of removals can be beneficial in some sawtimber stands, particularly older stands. In such cases, removals can reduce the risk of losses to mortality. Harvesting older stands can also return acres stocked with slow-growing timber back to productive condition. At the same time, the demand for a continued supply of sawtimber volume also should be considered. If high levels of removals are continued over the long term, the practice can lead to future sawtimber shortages. The potential impact on the future structure of Montana's timber resource outside NFS can be illustrated by an estimate of the percent change in number of softwood growing-stock trees by diameter class between the base year of 1979 and 2019 (fig. 14).

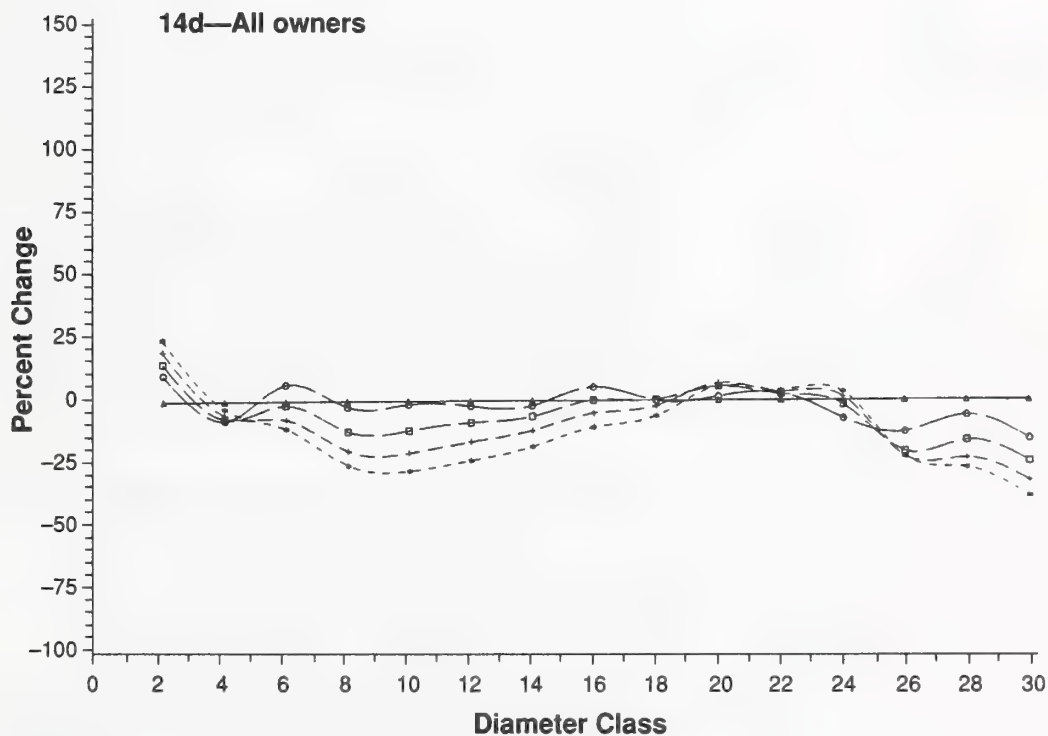
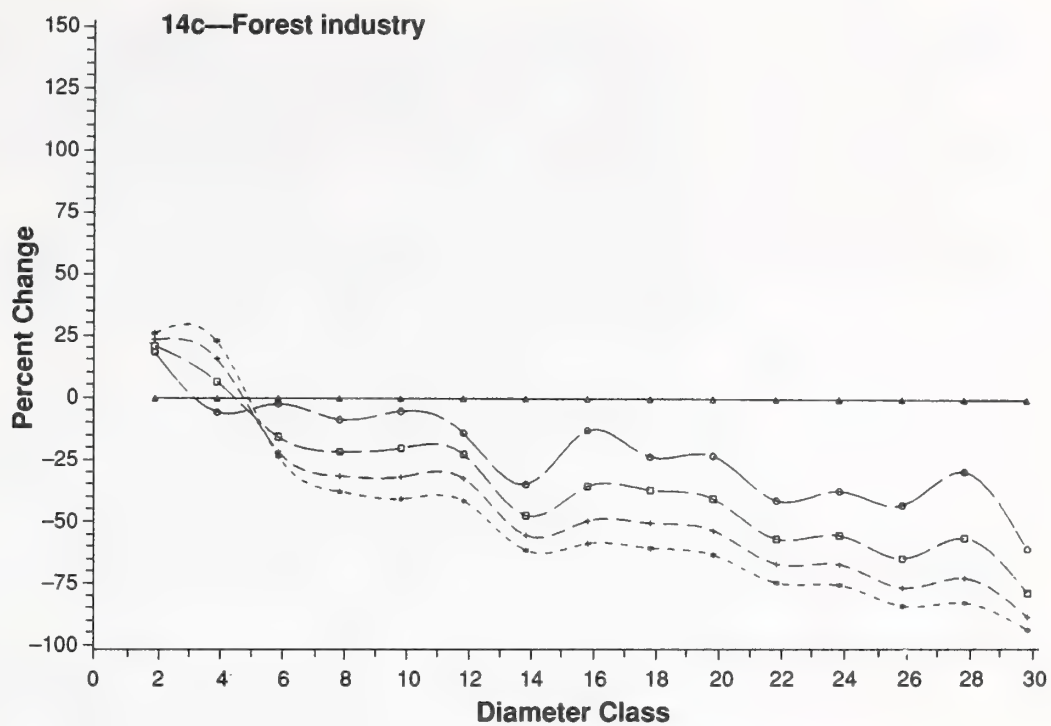
Based on remeasurement data, the actual change in numbers of trees between successive surveys—1979 and 1989—was used to calculate rates of change for growth, mortality, and removals for each diameter class. These rates were held constant during stand projections for the next three decades—specifically for the years 2000, 2010, and 2020. The percent change in numbers of trees by diameter class, rather than the actual change in number of trees, was used in the figure to help smooth the distribution curves. Because there were so few growing-stock trees in the larger diameter classes during 1979, the percent change in these classes was relatively large. The percent change for the smaller diameter classes was relatively small because of the large number of such trees in 1979.

At current rates of change, the number of softwood growing-stock trees in the 8- to 14-inch diameter classes could decrease by as much as 25 percent over the next 30 years. This is generally the case for all timberland outside the National Forests. Over 80 percent of the softwood sawtimber trees on these lands are currently less than 15 inches d.b.h. (appendix II, table 36); that means the estimated reductions affect the major portion of Montana's potential sawtimber resource on timberland outside the National Forests.



**Figure 14—Projected percent change in numbers of softwood growing-stock trees by diameter class on nonreserved timberland outside the National Forests in Montana.**





**Figure 14 (Con.)**

Projections show tree numbers in all diameter classes above 4 inches could decrease on forest industry timberland. The projected increase in the number of trees in the 2- and 4-inch diameter classes reflects a general transition of industry timberland from a sawtimber resource to one characterized by a predominance of younger sapling/seedling and poletimber stands.

In contrast, the projections for nonindustrial private and for State and other public timberland indicate a possible transition to stands of larger sawtimber trees. The actual change in the numbers of trees in diameter classes above 18-20 inches, however, will likely be minimal given the small numbers present initially.

The projected decrease in numbers of sawtimber trees on industry timberland is of particular importance. Industry's significant role in Montana's sawtimber supply has been noted. Short-term sawlog shortages could arise if the current situation remains unchanged; notably, the high rate of sawtimber removals relative to net growth. Evidence suggests, however, that this situation has not been restricted to forest industry lands; nor is it strictly a recent occurrence.

Sawtimber removals from Montana's forest industry timberland reportedly exceeded growth as early as 1962. By 1970 sawtimber was removed at nearly twice the level of growth (Schweitzer and others 1975). A subsequent report noted removals again exceeded growth on industry lands in Lincoln, Flathead, Sanders, and Missoula Counties in 1979, as did removals from nonindustrial private land in Sanders and Missoula Counties that year (Green and others 1985). Estimates from the 1989 inventory indicate that sawtimber removals continue to exceed net growth on private timberland in several counties, primarily in the northwestern corner of the State.

### **GROWTH-TO-CUT RATIOS**

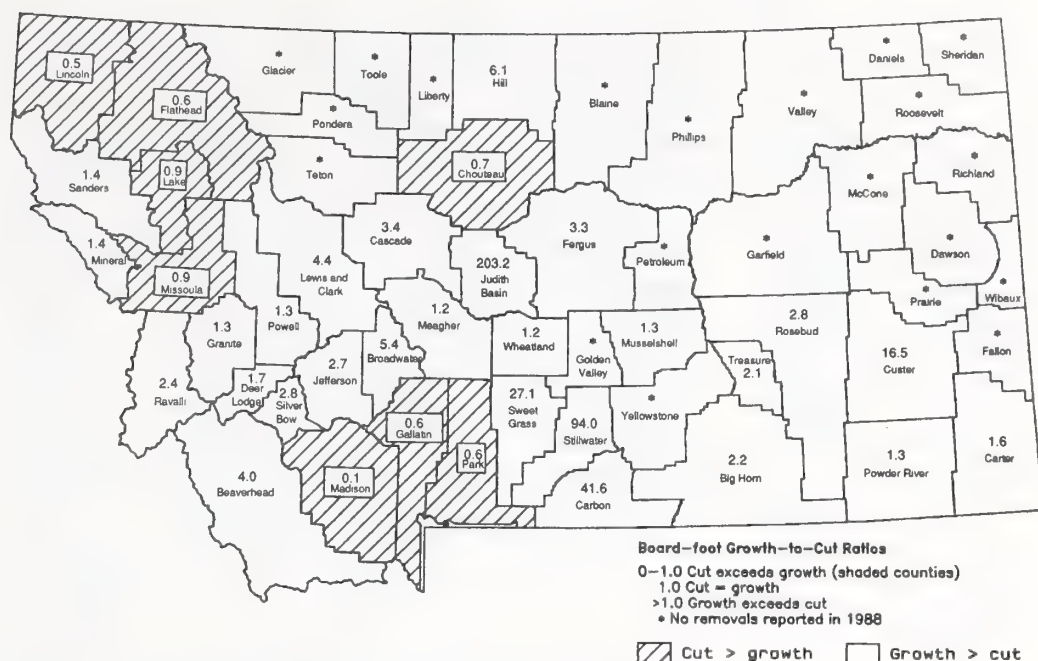
Growth-to-cut ratios are one way to quantify the effects of net annual growth and annual removals on sawtimber inventory. The ratio of growth in board feet to the cut in board feet was calculated for timberland outside National Forest System lands in each county (fig. 15). A growth-to-cut ratio of less than 1.0 indicates removals exceeded growth, decreasing sawtimber inventory. When the ratio exceeds 1.0, inventory is increasing. A ratio of 1.0 indicates the cut equals net growth. Inventory volume would remain constant.

Growth-to-cut ratios for timberland outside the National Forests in Lincoln, Flathead, Lake, and Missoula Counties were less than 1.0, indicating a shrinking sawtimber inventory. Sawtimber removals were estimated to be roughly twice the level of net growth on timberland in Lincoln and Flathead Counties in 1988.

Sawtimber inventory also decreased on timberland outside NFS in four counties east of the Continental Divide. Sawtimber removals exceeded net growth in Madison, Gallatin, Park, and Chouteau Counties.

The 12.1 million board feet (Scribner rule) of sawtimber reported to have been cut in Madison County during 1988 was more than 10 times the 1.1 million board feet of net sawtimber growth. Mortality was the reason net growth was so low. If removals levels are not adjusted downward to compensate for the years with high mortality, the growth-to-cut ratio can fall below 1.0. High mortality levels partially explain the low ratios for timberland in Gallatin, Madison, and Park Counties during 1988:





**Figure 15**—Board-foot growth-to-cut ratios for nonreserved timberland outside the National Forests, Montana, 1988.

County	Total growth ----- Million board feet ----- (Scribner rule)	Mortality	Net growth	Mortality as percent of total growth
Gallatin	20.2	7.0	13.2	35
Madison	21.5	20.5	1.1	95
Park	18.6	11.0	7.6	59

Mortality in these counties was inordinately high in 1988, offsetting much of the annual growth. Combined sawtimber removals from timberland outside NFS amounted to an additional 56.4 million board feet. The result was a net decrease in sawtimber inventory of 34.5 million board feet.

### OUTLOOK FOR PRIVATE SAWTIMBER INVENTORY

Sawtimber volume is being removed from private timberland in several Montana counties at a rate that exceeds net annual growth (based on 1989 inventory estimates) (table 4). Although it is unlikely that private sawtimber in these counties will be gone in 5, 10, or even 20 years, the supply of private sawtimber could be a concern over the long term, particularly in northwestern Montana. Sawtimber removals from private timberland in Flathead, Lincoln, and Missoula Counties totaled 364.0 million board feet, 52 percent of all sawtimber cut from timberland outside the National Forests and 32 percent of the total sawtimber removals in Montana during 1988. Private timberland's ability to continue to supply sawlogs of needed size and quantity over the long term can be questioned.

The National Forests are the other principal supplier of sawtimber volume in Montana. Increasing sawtimber harvest on National Forest timberland could help make up for the potential shortages. Growing-stock volume on these lands is projected to increase over the next several decades (Flowers

**Table 4**—Sawtimber volume, net annual growth, and removals estimates for private timberland in eight Montana counties

County	Sawtimber inventory volume (1989)	Net annual growth (1988)	Removals (1988)	Net growth as percent of inventory	Removals as percent of inventory
----- Million board feet ----- (Scribner rule)					
Chouteau	137.8	3.6	6.4	2.6	4.6
Flathead	1,854.0	77.8	143.3	4.2	7.7
Gallatin	798.6	11.5	21.3	1.4	2.7
Lake	1,328.1	34.3	43.4	2.6	3.3
Lincoln	1,904.4	49.9	105.7	2.6	5.6
Madison	491.9	- 2.3	9.9	—	2.0
Missoula	2,539.6	92.7	115.0	4.0	4.5
Park	754.5	6.9	12.0	1.0	1.6
Total	9,808.9	274.4	457.0	2.8	4.7

and others 1987). The needed volume will be “available,” at least physically. However, forest plans determine National Forest harvest levels. Pressure to reduce the cut on public land could force a low harvest alternative to be selected, meaning less volume would be available to offset mill shortages, should they occur.

The “checkerboard” ownership of some timberland in Montana also may limit timber supply from National Forest land. In such areas, sections of land that are publicly owned alternate with sections that are privately owned. This ownership pattern often means National Forest timber stands share boundaries with those in other ownerships. In cases where much of the adjacent timberland in a stream drainage already has been cut by another owner, the National Forest may reduce the timberland open to immediate harvest to avoid exceeding water quality standards set by the forest plan. Although the National Forest sawtimber volume may be available in the future, the timber supply is temporarily constrained.

## Current Harvest Activity

Different owners may choose to manage Montana’s forest land differently. Forest industry, for instance, has large landholdings in Montana. Industry timberland is intensively managed for timber production.

A nonindustrial private landowner may have only a few, to a few hundred, acres. The only “management” may be cutting a few trees, or a few acres of trees, to earn extra income. In fact, there may be no apparent effort to manage the timber resource at all.

Observation of a timber stand does not reveal a landowner’s plans for its management. But one management activity, timber harvesting, can be estimated based on observations during forest inventories.

### ACTIVITY BY TYPE OF CUTTING

Harvest activity on Montana’s timberland outside NFS was classified into one of several cutting types or into a single land clearing class (table 5). Land clearing is the conversion of forest land to pasture, range, roads, or powerline corridors. These types of activities give an indication of the area being removed from the timber base for nontimber uses.



**Table 5**—Distribution of harvest activity on nonreserved timberland outside the National Forests by type of cutting and cutting history, Montana, 1989

Type of cutting	Cutting history				Total
	Past year	1-3 years	3-10 years	More than 10 years	
	<i>Acres</i>				
Clearcut	17,561	40,067	130,415	240,242	428,285
Overstory removal	33,407	31,540	140,163	195,630	400,740
Selection harvest	49,313	76,682	559,832	1,078,276	1,764,103
Seed tree	2,039	15,566	109,686	52,955	180,246
Thinning	7,577	8,760	87,388	102,399	206,124
Post/pole harvest	5,854	5,690	40,029	106,864	158,437
Fuelwood	14,598	6,037	52,606	57,225	130,466
Other	—	19,283	138,998	451,896	610,177
Land clearing	5,869	—	25,639	—	31,508
Total	136,218	203,625	1,284,756	2,285,487	3,910,086
No evidence of cutting					3,715,194
Total area					7,625,280

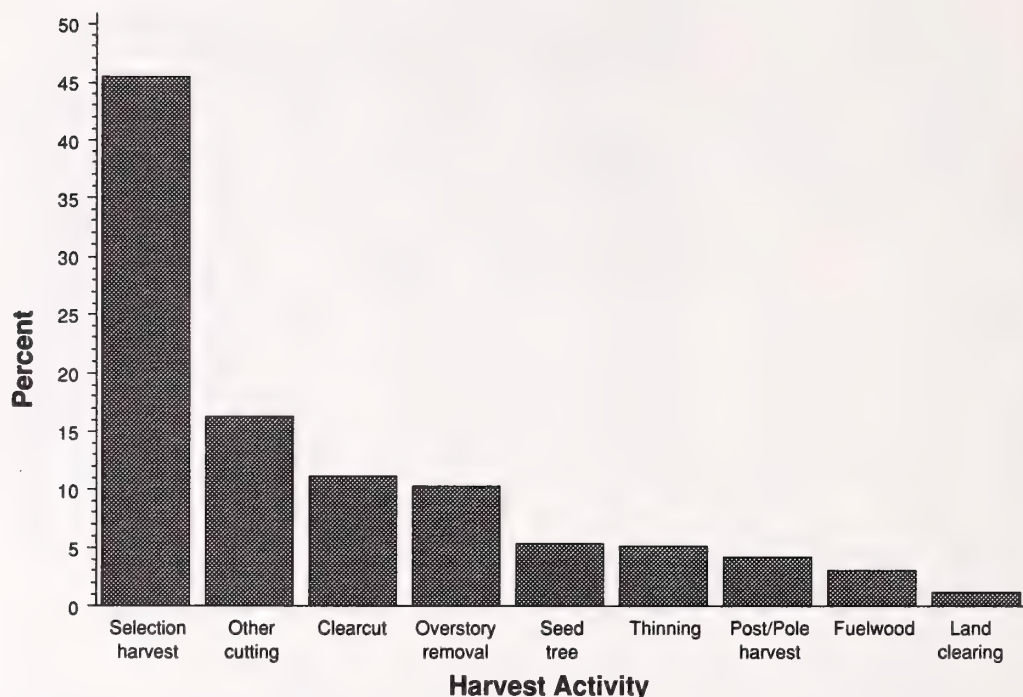
Clearcutting is the easiest of the harvest activities to identify. Other silvicultural methods involve removing specific components of a stand. They are more difficult to identify from field observations. Hence, there is some subjectivity in determining the particular type of cutting.

Over 3.9 million acres of timberland outside NFS showed signs of timber harvest. Selection harvest appeared to be the method of choice, occurring on over 45 percent of the timberland acres with evidence of cutting activity (fig. 16). In some cases, it is difficult to distinguish between selection cutting, a legitimate management practice, and high-grading, which gives quite different results. Stands determined to be high-graded and salvage cutting were classified "other" cutting. The other cutting class accounted for over 610,000 acres. Clearcutting was the third most common method of harvest. The 428,000 acres clearcut represented 11 percent of the area with evidence of harvest activity. Land clearing was evident on some 31,508 acres.

Less than 4 percent of the acres with evidence of cutting were thought to have been cut within the past year. About one-third were presumed to have been cut within the past 3 to 10 years.

#### ACTIVITY BY OWNER

Over half of all harvest activity on timberland outside NFS occurred on nonindustrial private land (table 6). The 2.1 million acres with evidence of harvest represented 47 percent of the area. Selection harvest was apparently the most popular cutting method on nonindustrial private timberland, accounting for 44 percent of the harvest activity on these lands. About 405,000 acres were classified other cutting. Only 134,000 acres had been clearcut. About 2 percent of the nonindustrial private acres were cut for land clearing. The 31,381 acres cleared accounted for nearly all the area removed from the timber base, but represent less than 1 percent of the nonindustrial private timberland area.



**Figure 16**—Distribution of nonreserved timberland area outside the National Forests by harvest activity, Montana, 1989.

Forest industry timberland accounted for most of the remaining area outside NFS with evidence of timber harvest. More than 1.2 million of industry's 1.6 million timberland acres have been harvested in the past; about 55 percent of the activity occurred within the past 10 years. The distribution of industry acres by type of cutting closely follows that of nonindustrial timberland, with the exception of the area clearcut. Over 246,000 acres of industry timberland have been clearcut within the recent past.

**Table 6**—Distribution of harvest activity on nonreserved timberland outside the National Forests by type of cutting and owner group, Montana, 1989

Type of cutting	Owner group				Total
	State	Other public	Forest industry	Nonindustrial private	
	<i>Acres</i>				
Clearcut	36,543	11,548	246,237	133,957	428,285
Overstory removal	20,456	17,102	172,526	190,656	400,740
Selection harvest	214,500	102,903	530,776	915,924	1,764,103
Seed tree	12,683	58	106,470	61,035	180,246
Thinning	25,799	9,314	39,633	131,378	206,124
Post/pole harvest	11,901	34,235	33	112,269	158,438
Fuelwood	5,910	13,763	496	110,296	130,465
Other	72,155	23,192	109,867	404,963	610,177
Land clearing	—	29	98	31,381	31,508
Total	399,947	212,144	1,206,136	2,091,859	3,910,086
No evidence of cutting	363,462	613,596	397,225	2,340,911	3,715,194
Total area	763,409	825,740	1,603,361	4,432,770	7,625,280



Clearcutting accounted for 20 percent of the harvest activity on timberland owned by the forest industry; clearcuts on forest industry land accounted for 57 percent of the total area clearcut. Another 530,776 acres were estimated to have undergone a recent selection harvest.

Other public lands had the least amount of activity. Only 212,144 acres of the nearly 826,000 timberland acres in this ownership showed signs of cutting. Just over half of the 763,409 acres of State land had indications of tree removal, with selection harvest the predominant cutting method.

## Habitat Types

Inventory locations were classified by habitat type (Cooper and Pfister 1988; Pfister and others 1977). Habitat types can be defined as lands potentially capable of producing similar plant communities at successional climax. The climax plant community, the end result of plant succession, reflects the integration of environmental factors affecting vegetation such as climate, soil, and landform.

Habitat types are named after the climax tree species, coupled with the name of the dominant or characteristic undergrowth species. The climax tree species is usually the most shade tolerant of the tree species adapted to the site. The tree level of classification is called the series, encompassing all habitat types having the same dominant tree at climax.

Habitat types are in contrast to forest cover type classifications that are based on current tree species occurrence. In presenting inventory data by habitat type, a picture of the forest resources of Montana can be drawn that is not limited to any one resource application, and that will not change with advancing succession or disturbance.

One hundred and twenty-seven primary habitat types were recorded on inventory locations. However, 10 common types make up 52 percent of the area inventoried. These 10 types, their geographic distribution, the percent of the area they represent, and their associated resource values (Pfister and others 1977) are presented in table 7. The geographic abbreviations in the table refer to the six areas in figure 17, plus eastern Montana (Cooper and Pfister 1988). The other 48 percent of the forested area is composed of 117 habitat types, each covering less than 3 percent of the area.

The resource value ratings are general and do not have exact definitions. A low rating of timberland productivity is given to sites in the northern Intermountain region with the potential to produce less than 50 cubic feet of wood per acre per year; a moderate rating to sites capable of producing 50 to 85 cubic feet; and a high rating to those able to produce more than 85 cubic feet. Potential livestock use is a general rating based on a combination of forage production and accessibility.

The use of climax vegetation to name habitat types does not imply an abundance of climax vegetation in the present landscape. In fact, most of the forest landscape reflects some form of disturbance and various stages of succession. Fire is a natural disturbance that affects the successional development of forests. Timber management activities do so as well. The use of climax vegetation to name habitat types is not to suggest that climax conditions should be a management goal; seral species are often preferred for timber or wildlife habitat.

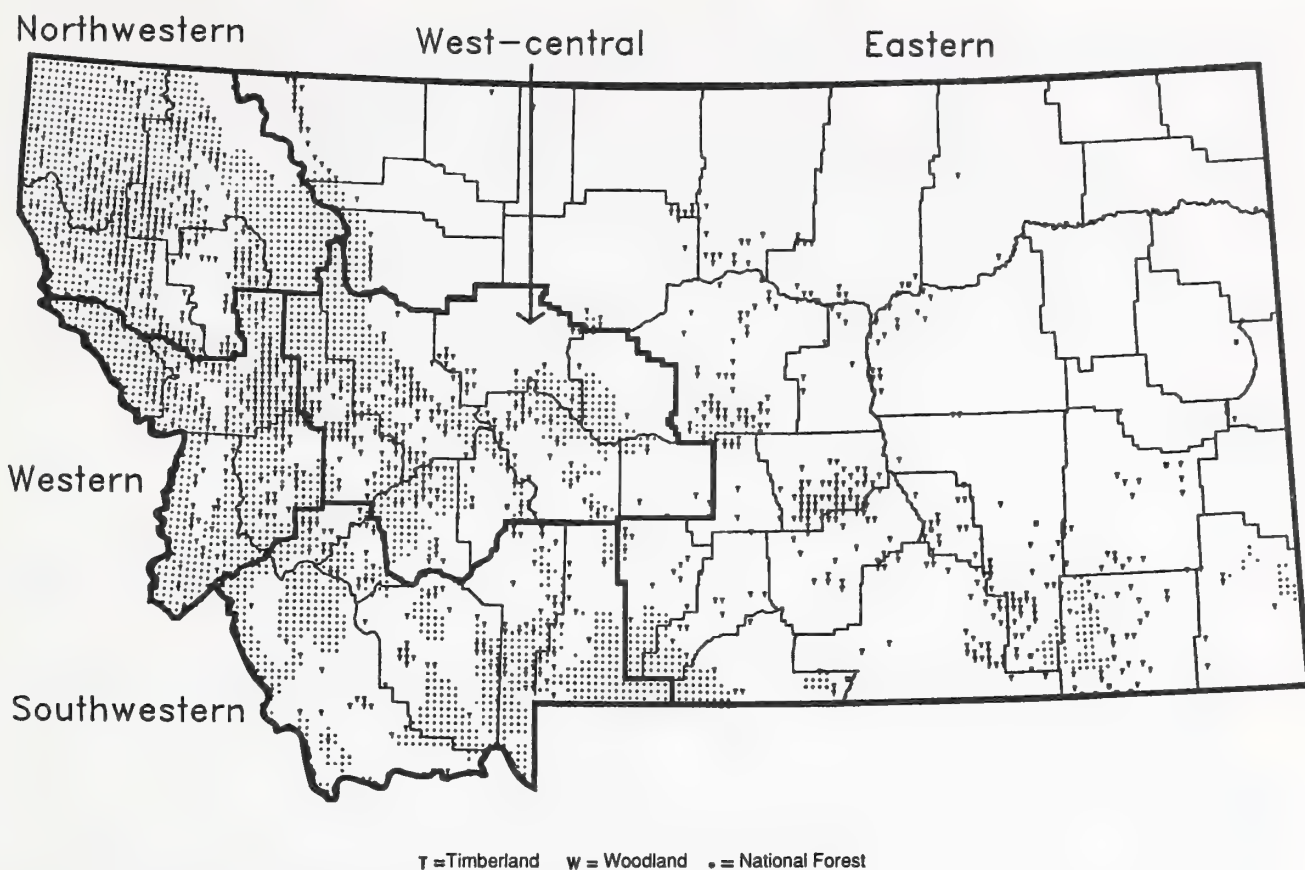
Another tabulation illustrates the mix of successional vegetation and climax types. Table 8 presents the distribution of different tree species within each habitat type series for timberland outside NFS. It also includes the percent of total forested area outside NFS accounted for by each series.

Table 7—Relative resource value ratings for selected habitat types, Montana, 1989

Habitat type	Distribution in Montana	General timber productivity <sup>1</sup>	Wildlife use/browse production	Potential for livestock use <sup>2</sup>	Other considerations	Percent of area
<i>Pinus ponderosa</i> / <i>Agropyron spicatum</i>	Widespread, driest sites	Low to very low	Deer winter range, occasional elk use	Moderate		10
<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i>	Common, warm slopes	Low to high, depends on phase	Moderate deer use year round; occasional elk, moose	Low		9
<i>Pseudotsuga menziesii</i> / <i>Calamagrostis rubescens</i>	Most ubiquitous, moderately dry slopes	Low to moderate	Moderate big-game use, depends on phase	Low		7
<i>Pseudotsuga menziesii</i> / <i>Physocarpus malvaceus</i>	Widespread; cool, moist slopes	Moderate to high in northwestern, west-central, southwestern	Heavy big-game use in winter	Low		6
<i>Pinus ponderosa</i> / <i>Festuca idahoensis</i>	Widespread, not as dry as PIPO/AGSP <sup>3</sup>	Low	Deer year round, elk winter range	High	Potential conflict between livestock and game for forage	5
<i>Pinus ponderosa</i> / <i>Juniperus scopulorum</i>	Central, south-central, southeastern, eastern; dry sites	Low	Deer use year round	Moderate		3
<i>Pseudotsuga menziesii</i> / <i>Agropyron spicatum</i>	Central, west-central; warm, dry extreme of series	Low to very low	Frequently used big-game winter range	Moderate, but limited by steep slopes		3
<i>Pseudotsuga menziesii</i> / <i>Linnaea borealis</i>	Major type in northwestern, west-central, central; moist sites	Moderate in western	Moderate big-game use year round	Low		3
<i>Pseudotsuga menziesii</i> / <i>Vaccinium caespitosum</i>	Common in northwestern, west-central, central; warm, moist sites	Moderate to high	Moderate big-game use	Low	Often used for recreation sites, campgrounds, summer homes	3
<i>Pseudotsuga menziesii</i> / <i>Vaccinium globulare</i>	Prominent in central, cold sites	Low to moderate	Moderate big-game use	Low	Important for production of berries utilized by bears, grouse, other wildlife, and humans	3
<i>Abies lasiocarpa</i> / <i>Clintonia uniflora</i>	Extensive in northwestern; moist, warm sites	High to very high	Good big-game forage production, early successional stages	Low	High watershed values, heavy snowpack accumulation	3
					Total	452

<sup>1</sup>For timber productivity in the northern Intermountain region, low = < 50 ft<sup>3</sup>/acre/yr, moderate = 50-85 ft<sup>3</sup>/acre/yr, and high = > 85 ft<sup>3</sup>/acre/yr.<sup>2</sup>Potential for livestock use incorporates forage production and accessibility.<sup>3</sup>*Pinus ponderosa*/*Agropyron spicatum*.<sup>4</sup>The other 48 percent of the forested area is composed of 117 habitat types, each 3 percent or less.





**Figure 17**—Distribution of timberland and woodland field locations outside the National Forests in the five sample areas of Montana, 1989.

**Table 8**—Percent distribution of trees by species within each habitat type series, Montana, 1989

Habitat type series	Species											Percent of total forested area
	<i>Pseudotsuga menziesii</i>	<i>Pinus ponderosa</i>	<i>Pinus contorta</i>	<i>Pinus flexilis</i>	<i>Larix lyallii</i>	<i>Abies lasiocarpa</i>	<i>Picea engelmannii</i>	<i>Pinus albicaulis</i>	<i>Abies grandis</i>	<i>Thuja plicata</i>	<i>Tsuga mertensiana</i>	
	Percent											
<i>Pseudotsuga menziesii</i>	61	13	21	2	3	—	—	—	—	—	—	40
<i>Pinus ponderosa</i>	2	97	—	1	—	—	—	—	—	—	—	20
<i>Abies lasiocarpa</i>	11	—	34	1	4	35	11	4	—	—	—	11
<i>Abies grandis</i>	33	1	20	—	16	1	5	—	21	3	—	5
<i>Pinus contorta</i>	16	9	53	19	—	—	—	2	—	—	—	3
<i>Thuja plicata</i>	10	1	11	—	9	6	7	—	11	40	5	3
<i>Picea</i> spp.	32	—	46	—	3	2	17	—	—	—	—	2
Other <sup>1</sup>	—	—	—	—	—	—	—	—	—	—	—	10
Eastern <sup>2</sup>	—	—	—	—	—	—	—	—	—	—	—	6
Total												100

<sup>1</sup>Includes unclassified land and miscellaneous habitat type series.

<sup>2</sup>Includes all habitat types classified by Cooper and Pfister 1988.

## STANDARD FOREST SURVEY TERMINOLOGY

**Basal area**—The cross-sectional area of a tree expressed in square feet.

For timber species the calculation is based on diameter at breast height (d.b.h.); for woodland species it is based on diameter at root collar (d.r.c.).

**Christmas tree grade**—Pinyon species are classified as Christmas trees using the following guidelines:

Premium—Excellent conical form with no gaps in branches and a straight bole.

Standard—Good conical form with small gaps in branches and bole slightly malformed.

Utility—Conical in form with branches missing and bole bent or malformed.

Cull—Not meeting one of the above classifications or over 12 feet in height.

**Cord**—A stack of wood equivalent to 128 cubic feet of wood and air space having standard dimensions of 4 by 4 by 8 feet. An average conversion factor of 75 cubic feet of solid wood per cord is used.

**Crown cover**—Percentage of the ground surface covered by a vertical projection of tree crowns. Synonymous with canopy cover.

**Cull trees**—Live timber species trees that are unmerchantable now or prospectively (see Rough trees and Rotten trees).

**Cull volume**—Portions of the volume in a timber species tree that are not usable for wood products because of rot, missing material, dead material, or other cubic-foot defect.

**Diameter at breast height (d.b.h.)**—Diameter of the stem measured 4.5 feet above the ground.

**Diameter at root collar (d.r.c.)**—Diameter equivalent for a woodland species, taken at the point nearest the ground line that represents the basal area of the tree stem or stems.

**Diameter classes**—Tree diameters, either d.b.h. or d.r.c., grouped into 2-inch classes, with the even inch the midpoint for the class.

**Diameter outside bark (d.o.b.)**—Tree diameter measurement taken over the bark.

**Distance to road**—The distance from a sample site to the nearest improved road that could be accessed from the site. Improved roads are permanent, maintained roads.

**Farmer / rancher-owned lands**—Lands owned by a person who operates a farm or a ranch and who either does or directly supervises the work.

**Fenceposts**—Juniper and oak species are evaluated for post potential using the following criteria:

Line post—A 7-foot minimum length with a 5- to 7-inch diameter butt, 2.5-inch minimum small-end diameter, and reasonably straight and solid.

Corner post—An 8-foot minimum length with a 7- to 9-inch diameter butt, 2.5-inch minimum small-end diameter, and reasonably straight and solid.



*Forest industry lands*—Lands owned by companies or individuals operating a primary wood-processing plant, either within the State's boundaries or in nearby States or Provinces.

*Forest lands*—Lands at least 10 percent stocked by forest trees of any size, including lands that formerly had such tree cover and that will be regenerated naturally or artificially. The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of trees must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, and clearings in forest areas are classified as forest if they are less than 120 feet wide.

*Forest trees*—Woody plants having a well-developed stem or stems, usually more than 12 feet tall at maturity, with a generally well-defined crown.

*Forest type*—A classification of forest land based upon and named for the tree species presently forming a plurality of live-tree stocking.

*Gross annual growth*—The average annual increase in the net volume of trees.

*Gross volume in board feet*—The board-foot volume in the sawlog portion of a sawtimber tree. Volume is computed from a 1-foot stump to a minimum sawlog top of 7 inches d.o.b. for softwoods, or 9 inches d.o.b. for hardwoods; or to the point where the central stem breaks into limbs.

*Growing-stock trees*—Live timber species trees meeting specified standards of quality and vigor; excludes cull trees.

*Growing-stock volume*—Net cubic-foot volume in live poletimber-size and sawtimber-size growing-stock trees from a 1-foot stump to a minimum 4-inch top (of central stem) outside bark or to the point where the central stem breaks into limbs.

*Growth*—See Net annual growth.

*Hardwood trees*—Trees that are usually broad leaved and deciduous.

*Indian Trust*—Indian lands held in trust by the Federal Government for a Native American tribe or individual.

*Industrial wood*—All commercial roundwood products except fuelwood.

*Land area*—The area of dry land and land temporarily or partially covered by water such as marshes, swamps, river flood plains, streams, sloughs, estuaries, and canals less than 120 feet wide; and lakes, reservoirs, and ponds less than 1 acre.

*Logging residue*—The unused portions within the merchantable sections of growing-stock trees cut or killed during logging.

*Mill or plant residue*—Wood material from mills or other primary manufacturing plants that is not utilized for the mill's or plant's primary product. Mill or plant residue includes bark, slabs, edgings, trimmings, miscuts, sawdust, and shavings. Much of the mill and plant residue is used as fuel and as the raw material for such products as pulp, pelletized fuel, fiberwood, mulch, and animal bedding. Mill or plant residue includes bark and the following components:

Coarse residue—Wood material suitable for chipping, such as slabs, edgings, and trim.

Fine residue—Wood material unsuitable for chipping, such as sawdust, shavings, and veneer clippings.

*Miscellaneous Federal lands*—Lands administered by Federal agencies other than the Forest Service, U.S. Department of Agriculture, or the Bureau of Land Management, U.S. Department of the Interior.

*Mortality*—The net volume of growing-stock trees that have died from natural causes during a specified period.

*National Forest lands*—Public lands administered by the Forest Service, U.S. Department of Agriculture.

*Net annual growth*—Gross annual growth minus average annual mortality.

*Net dead volume*—For woodland species, net volume of dead trees plus net volume of dead material in live trees.

*Net volume in board feet*—The gross board-foot volume in the sawlog portion of growing-stock trees, less deductions for cull volume.

*Net volume in cubic feet*—For timber species, gross cubic-foot volume in the merchantable portion of trees, less deductions for cull volume. Volume is computed for the merchantable stem from a 1-foot stump to a minimum 4-inch top d.o.b., or to the point where the central stem breaks into limbs. For woodland species, gross cubic-foot volume less deductions for dead, missing, and rotten material. Volume is calculated for trees 3.0 inches and larger d.r.c. to a stem or branch top of 1.5 inches d.o.b.

*Nonforest lands*—Lands that do not currently qualify as forest land.

*Nonindustrial private*—All private ownerships except forest industry.

*Nonstocked areas*—Forest land less than 10 percent stocked with live trees.

*Other private lands*—Privately owned lands other than forest industry or Indian Trust.

*Other public lands*—Public lands administered by agencies other than the Forest Service, U.S. Department of Agriculture. Includes lands administered by other Federal, State, county, and local government agencies, including lands leased by these agencies for more than 50 years.

*Other removals*—The net volume of growing-stock trees removed from the inventory by cultural operations, such as timber-stand improvement, by land clearing, and by changes in land use, such as a shift to wilderness.

*Poletimber stands*—Stands at least 10 percent stocked with growing-stock trees, in which half or more of the stocking is sawtimber or poletimber trees or both, with poletimber stocking exceeding that of sawtimber (see Stocking).

*Poletimber trees*—Live timber species trees at least 5 inches d.b.h., but smaller than sawtimber.

*Potential growth*—The average net annual cubic-foot growth per acre at culmination of mean annual growth attainable in fully stocked natural stands.

*Primary wood-processing plants*—Plants using roundwood products, such as sawlogs, pulpwood bolts, and veneer logs.



- Productivity*—Potential yield capability of a stand (in cubic feet per acre per year) calculated here as a function of site index.
- Productivity class*—A classification of forest land that reflects biological potential. For timberlands, the index used is the potential net annual growth at culmination of mean annual increment in fully stocked natural stands. Woodland is classified as “high site” where sustained wood production is likely, or as “low site” where the continuous production of wood is unlikely.
- Removals*—The net volume of growing-stock trees removed from the inventory by harvesting, cultural operations, land clearing, and changes in land use.
- Reserved forest land*—Forest land withdrawn from tree utilization through statute or administrative designation.
- Residue*—See Mill or plant residue.
- Rotten trees*—Live poletimber or sawtimber trees with more than 67 percent of the total cubic-foot volume cull and with more than half of the cull volume attributable to rotten or missing material.
- Rough trees*—Live poletimber or sawtimber trees with more than 67 percent of the total cubic-foot volume cull and with less than half of the cull volume attributable to rotten or missing material.
- Roundwood*—Logs, bolts, or other round sections cut from trees.
- Salvable dead trees*—Standing dead timber species trees that meet growing-stock standards.
- Saplings*—Live timber species trees 1 to 4.9 inches d.b.h. or woodland tree species 1 to 2.9 inches d.r.c.
- Sapling and seedling stands*—Timberland stands at least 10 percent stocked on which more than half of the stocking is saplings or seedlings, or both.
- Sawlog portion*—That part of the bole of sawtimber trees between a 1-foot stump and the sawlog top.
- Sawlog top*—The point on the bole of sawtimber trees above which a sawlog cannot be produced. The minimum sawlog top is 7 inches d.o.b. for softwoods and 9 inches d.o.b. for hardwoods.
- Sawtimber stands*—Stands at least 10 percent stocked with growing-stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.
- Sawtimber trees*—Live timber species trees meeting regional size and defect specifications. Softwood trees must be at least 9 inches d.b.h. and hardwood trees 11 inches d.b.h.
- Sawtimber volume*—Net volume in board feet of the sawlog portion of live sawtimber trees.
- Seedlings*—Established live timber species trees less than 1 inch d.b.h. or woodland species less than 1 inch d.r.c.

*Site index*—Expected height (in feet) of a tree on a site at age 50 (or 80 for aspen and cottonwood) calculated from height-to-age equations. Trees selected for site index calculations are dominant or codominant within the stand, age 30 to 200 years, showing high vigor.

*Softwood trees*—Coniferous trees that are usually evergreen and have scalelike or linear needlelike leaves.

*Standard error*—An expression of the degree of confidence that can be placed on an estimated total or average obtained by statistical sampling methods. Standard errors do not include technique errors that occur in photo work, field measurements, or compilation.

*Stand-size classes*—A classification of forest land based on the predominant size of trees present (see Sawtimber stands, Poletimber stands, and Sapling and seedling stands).

*Stocking*—An expression of the extent to which growing space is effectively utilized by present or potential growing-stock trees.

*Stocking condition*—A categorization of timberland reflecting the degree to which the site is being utilized by growing-stock trees and other conditions affecting current and prospective timber growth (see Stocking):

Overstocked—Sites at least 60 percent stocked with growing-stock trees, but overstocked with live trees, including live cull trees.

Fully stocked—Sites at least 60 percent stocked with growing-stock trees and not overstocked.

Medium to fully stocked—Sites 35 to 60 percent stocked with growing-stock trees. Includes areas where other trees, inhibiting vegetation, or surface conditions prevent occupancy by growing-stock trees.

Poorly stocked—Sites less than 35 percent stocked with growing-stock trees.

Nonstocked—Forest land less than 10 percent stocked with growing-stock trees.

Mature—Sites with stands older than 100 years.

*Timberland*—Forest land where timber species make up at least 10 percent stocking. (This is equivalent to the definition for commercial forest land in Forest Service Handbook 4809.)

*Timber species*—Tree species traditionally used for industrial wood products. In the Interior West States, these include aspen, cottonwood, and paper birch hardwood species and all softwood species except pinyon and juniper.

*Timber stand improvement*—Treatments such as thinning, pruning, release cutting, girdling, weeding, or poisoning of unwanted trees to improve growing conditions for the remaining trees.

*Upper-stem portion*—That part of the main stem or fork of sawtimber trees above the sawlog top to a minimum top diameter of 4 inches outside bark or to the point where the main stem or fork breaks into limbs.

*Water*—Streams, sloughs, estuaries, and canals more than 120 feet wide, and lakes, reservoirs, and ponds larger than 1 acre at mean high water level.



- Wilderness*—An area of undeveloped land currently included in the Wilderness System, managed to preserve its natural conditions and retain its primeval character and influence.
- Woodland*—Forest land where timber species make up less than 10 percent stocking.
- Woodland average stand diameter class*—A woodland stand classification based on the quadratic mean diameter (the diameter corresponding to the tree of average basal area d.r.c.) of the woodland component of the stand.
- Woodland profile*—A classification of woodland that combines slope, volume per acre, site class, and tree crown cover.
- Woodland species*—Tree species not usually converted into industrial wood products. Common uses are fuelwood, fenceposts, and Christmas trees.

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## APPENDIX I: INVENTORY PROCEDURE FOR LAND OUTSIDE THE NATIONAL FORESTS

The State was divided into five sample areas (fig. 17) for which separate information and precision requirements were needed. Each of these sample areas was unique in respect to stratification methods, sample intensity, and some of the data collected. However, the basic inventory design and core data were compatible for summaries at the county, owner group, and State levels.

The inventory was sample based and used a two-phase statistical design. A primary phase estimated areas of sampling strata based on the classification of 312,985 sample points systematically placed on the latest aerial photographs. During the inventory's field phase the strata were sampled on the ground to obtain detailed classification and measurement data.

Area estimates were adjusted to meet Bureau of the Census gross areas by county. All primary and field data were registered to the Universal Transverse Mercator (UTM) map projection, then primary and field sample data were located using the UTM Grid System (U.S. Department of Defense, Army 1973).

### Field Sampling

Detailed land classification and estimates for timberland and woodland characteristics and volume were based on observations and measurements recorded at 12,160 field sample locations, of which 1,401 were forested (fig. 17).

Sample trees for timberland were selected using a 10-point cluster (USDA Forest Service 1988). Trees less than 5.0 inches d.b.h. were measured on a  $\frac{1}{300}$ -acre fixed radius plot. Trees 5.0 inches d.b.h. or larger were selected using a variable radius plot based on a 40-basal-area-factor angle gauge. Sample trees for woodland were selected using a  $\frac{1}{10}$ -acre or a  $\frac{1}{5}$ -acre fixed radius plot for trees 3.0 inches diameter at root collar (d.r.c.) and larger. Trees less than 3.0 inches d.r.c. were tallied on  $\frac{1}{300}$ -acre subplots. Understory vegetation cover was estimated on  $\frac{1}{20}$ -acre subplots.

### Compilation

The photo and field data were entered into a computer file and edited to assure accuracy and coding consistency, and to produce quality control summaries. Final estimates from these data were based on statistical summaries, a portion of which is included in this bulletin. Volume and defect were computed using the most appropriate equations, including those developed by Chojnacky (1985), Kemp (1958), and Moisen (1990).

### Data Reliability

Standard error percentages calculated at the 67 percent confidence level for major classes of land outside the National Forests are shown in table 32 and for volume, growth, and mortality in table 33. Individual cells within tables should be used with caution. Some are based on small sample sizes, which may result in high sampling errors.

## Area

Ownership class	Nonreserved			Reserved			Total						
	Timberland	Woodland	Nonforest	Total	Timberland	Woodland	Nonforest	Total					
<hr/>													
Land													
Public													
National Forest <sup>1</sup>	11,356,442	—	2,069,452	13,425,894	2,476,112	—	895,501	3,371,613	13,832,554	—	2,964,953	16,797,507	
Other public													
Bureau of Land Management	729,642	15,477	7,233,257	7,978,376	14,824	—	83,210	98,034	744,466	15,477	7,316,467	8,076,410	
National Parks <sup>2</sup>	—	—	—	—	746,928	5,946	462,893	1,215,767	746,928	5,946	462,893	1,215,767	
Miscellaneous Federal State	90,064	3,837	970,042	1,063,943	20,205	—	52,825	73,030	110,269	3,837	1,022,867	1,136,973	
County and municipal	763,409	5,297	4,642,650	5,411,356	4,594	497	16,926	22,017	768,003	5,794	4,659,576	5,433,373	
	6,034	107	21,825	27,966	—	—	—	—	6,034	107	21,825	27,966	
Total other public	1,589,149	24,718	12,867,774	14,481,641	786,551	6,443	615,854	1,408,848	2,375,700	31,161	13,483,628	15,890,489	
Total public	12,945,591	24,718	14,937,226	27,907,535	3,262,663	6,443	1,511,355	4,780,461	16,208,254	31,161	16,448,581	32,687,996	
Private													
Indian Trust	671,506	1,747	4,095,975	4,769,228	173,085	12,766	263,998	449,849	844,591	14,513	4,359,973	5,219,077	
Forest industry	1,603,362	32	126,491	1,729,885	—	—	—	—	1,603,362	32	126,491	1,729,885	
Other private	3,761,264	44,854	49,947,889	53,754,007	1,618	—	37,859	39,477	3,762,882	44,854	49,985,748	53,793,484	
Total private	6,036,132	46,633	54,170,355	60,253,120	174,703	12,766	301,857	489,326	6,210,835	59,399	54,472,212	60,742,446	
Total land area	18,981,723	71,351	69,107,581	88,160,655	3,437,366	19,209	1,813,212	5,269,787	22,419,089	90,560	70,920,793	93,430,442	
Water													
Total land and water <sup>3</sup>	18,981,723	71,351	69,107,581	88,160,655	3,437,366	19,209	1,813,212	5,269,787	22,419,089	90,560	70,920,793	94,109,178	
												678,736	

National Forest area data were obtained from the USDA Forest Service 1990 Resources Planning Act (RPA) data base.

<sup>3</sup>Not included with miscellaneous Federal, a component of other public, for purpose of clarity. These lands are reserved and are included in tables 9, 10, 32, and 34 only.

<sup>3</sup>U.S. Department of Commerce, Bureau of the Census. 1980.



**Table 10—Area of forest land by forest type, owner group, and land class, Montana, 1989**

Forest type	Owner group									
	National Forest		Other public		Forest industry		Private		All owners	
	Reserved	Nonreserved	Reserved	Nonreserved	Reserved	Nonreserved	Reserved	Nonreserved	Reserved	Nonreserved
	Acres									
Douglas-fir	404,741	3,358,000	183,088	628,717	—	881,103	40,279	1,521,007	628,108	6,388,827
Western hemlock	—	17,651	—	135	—	6,111	—	6,274	—	30,171
Ponderosa pine	—	630,611	12,199	505,636	—	96,635	36,092	1,777,753	48,291	3,010,635
Western white pine	—	32,039	—	—	—	—	—	—	—	32,039
Lodgepole pine	494,662	3,354,350	315,565	239,253	—	223,554	25,576	329,618	835,803	4,146,775
Western larch	13,962	695,506	—	48,258	—	123,300	—	78,569	13,962	945,633
Western redcedar	—	90,522	—	4,972	—	13,843	—	12,548	—	121,885
Limber pine	7,083	78,318	—	7,639	—	5,260	—	54,324	7,083	145,541
Grand fir	—	116,161	1,045	11,344	—	57,110	—	39,919	1,045	224,534
Spruce-fir	139,931	1,187,705	259,196	99,971	—	145,614	65,606	121,305	464,733	1,554,595
Engelmann spruce	91,804	545,064	504	17,120	—	50,511	—	55,027	92,308	667,722
Whitebark pine	248,460	—	—	—	—	—	—	—	248,460	—
Misc. western softwoods¹	1,072,137	1,243,605	4,691	—	—	—	3,131	—	1,079,959	1,243,605
Aspen	3,332	6,910	8,953	11,941	—	260	2,668	198,846	14,953	217,957
Cottonwood²	—	—	1,310	14,163	—	61	1,350	237,580	2,660	251,804
Total timberland	2,476,112	11,356,442	786,551	1,589,149	—	1,603,362	174,702	4,432,770	3,437,365	18,981,723
Juniper	—	—	5,967	24,718	—	32	11,778	46,601	17,745	71,351
Other³	—	—	476	—	—	—	988	—	1,464	—
Total woodland	—	—	6,443	24,718	—	32	12,766	46,601	19,209	71,351
Total all types⁴	2,476,112	11,356,442	792,994	1,613,867	—	1,603,394	187,468	4,479,371	3,456,574	19,053,074
										22,509,648

<sup>1</sup>For National Forest, miscellaneous western softwoods includes juniper, mountain hemlock, and nonstocked forest land.

<sup>2</sup>Includes paper birch.

<sup>3</sup>Includes oak/maple and mountain mahogany.

<sup>4</sup>On this and all following tables, totals may vary due to rounding.

**Table 11—Area of timberland by stand volume and owner group, Montana, 1989**

Stand volume per acre <sup>1</sup>	Owner group						
	National Forest			Other public		Total	
	Forest	State	Other	Other public	Forest industry	Nonindustrial private	Total
	Acres						
Less than 1,500 board feet	2,779,558	159,083	362,363	521,446	579,952	1,434,512	5,315,468
1,500 to 4,999 board feet	3,281,727	238,920	237,592	476,512	502,868	1,747,864	6,008,971
5,000 to 9,999 board feet	2,885,329	168,579	99,140	267,719	266,808	798,386	4,218,242
10,000 board feet or more	2,409,828	196,827	126,645	323,472	253,734	452,008	3,439,042
All classes	11,356,442	763,409	825,740	1,589,149	1,603,362	4,432,770	18,981,723

<sup>1</sup>International 1/4-inch rule.

**Table 12**—Area of timberland by forest type, stand-size class, and productivity class, Montana, 1989

Forest type and stand-size class	Productivity class						Total acres
	165+	120-164	85-119	50-84	20-49	0-19	
	----- Acres -----						
Douglas-fir							
Sawtimber	—	32,375	792,784	2,256,787	1,580,799	255,542	4,918,287
Poletimber	—	—	20,857	256,542	346,451	27,095	650,945
Sapling and seedling	—	6,112	52,360	256,549	325,236	33,631	673,888
Nonstocked	—	—	7,538	7,885	111,010	19,274	145,707
Total	—	38,487	873,539	2,777,763	2,363,496	335,542	6,388,827
Western hemlock							
Sawtimber	—	—	11,886	11,267	—	—	23,153
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	6,111	907	—	7,018
Nonstocked	—	—	—	—	—	—	—
Total	—	—	11,886	17,378	907	—	30,171
Ponderosa pine							
Sawtimber	7,893	22,102	76,593	575,736	1,237,731	95,304	2,015,359
Poletimber	—	—	—	33,366	259,620	5,869	298,855
Sapling and seedling	—	—	6,083	88,179	317,190	—	411,452
Nonstocked	—	—	—	11,735	242,268	30,966	284,969
Total	7,893	22,102	82,676	709,016	2,056,809	132,139	3,010,635
Western white pine							
Sawtimber	—	—	27,243	4,041	—	—	31,284
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	755	—	—	—	755
Nonstocked	—	—	—	—	—	—	—
Total	—	—	27,998	4,041	—	—	32,039
Lodgepole pine							
Sawtimber	—	196	491,914	1,413,908	1,055,920	130,201	3,092,139
Poletimber	—	11,111	68,223	276,602	240,153	17,064	613,153
Sapling and seedling	—	—	34,640	148,839	169,892	27,045	380,416
Nonstocked	—	—	16,891	14,517	20,762	8,897	61,067
Total	—	11,307	611,668	1,853,866	1,486,727	183,207	4,146,775
Western larch							
Sawtimber	—	—	337,634	251,033	8,076	15,658	612,401
Poletimber	—	—	17,022	58,899	—	—	75,921
Sapling and seedling	—	1,548	88,828	130,368	23,932	2,527	247,203
Nonstocked	—	—	2,377	—	7,731	—	10,108
Total	—	1,548	445,861	440,300	39,739	18,185	945,633
Western redcedar							
Sawtimber	—	—	94,927	15,307	—	—	110,234
Poletimber	—	—	—	6,409	—	—	6,409
Sapling and seedling	—	—	5,242	—	—	—	5,242
Nonstocked	—	—	—	—	—	—	—
Total	—	—	100,169	21,716	—	—	121,885
Limber pine							
Sawtimber	—	—	—	6,554	16,161	29,321	52,036
Poletimber	—	—	—	—	14,749	17,813	32,562
Sapling and seedling	—	—	—	—	14,324	1,687	16,011
Nonstocked	—	—	—	—	35,725	9,207	44,932
Total	—	—	—	6,554	80,959	58,028	145,541

(con.)



**Table 12 (Con.)**

Forest type and stand-size class	Productivity class						Total acres
	165+	120-164	85-119	50-84	20-49	0-19	
	----- Acres -----						
Grand fir							
Sawtimber	—	16,366	84,718	43,675	18,182	—	162,941
Poletimber	—	—	1,628	—	—	—	1,628
Sapling and seedling	—	—	34,524	12,765	—	—	47,289
Nonstocked	—	—	—	12,676	—	—	12,676
Total	—	16,366	120,870	69,116	18,182	—	224,534
Spruce-fir <sup>1</sup>							
Sawtimber	—	—	229,077	257,699	371,134	266,590	1,124,500
Poletimber	—	—	7,468	70,541	63,129	31,339	172,477
Sapling and seedling	—	—	27,995	86,922	58,803	67,093	240,813
Nonstocked	—	—	706	4,767	3,399	7,933	16,805
Total	—	—	265,246	419,929	496,465	372,955	1,554,595
Engelmann spruce							
Sawtimber	—	—	223,918	163,994	78,118	72,191	538,221
Poletimber	—	—	10,648	28,506	—	4,465	43,619
Sapling and seedling	—	—	34,048	22,356	3,457	4,140	64,001
Nonstocked	—	—	—	3,092	18,789	—	21,881
Total	—	—	268,614	217,948	100,364	80,796	667,722
Misc. western softwoods <sup>2</sup>							
Sawtimber	—	—	—	11,308	23,266	168,571	203,145
Poletimber	—	—	1,473	—	—	53,302	54,775
Sapling and seedling	—	—	—	—	22,068	136,479	158,547
Nonstocked	—	145	4,698	89,733	242,869	489,693	827,138
Total	—	145	6,171	101,041	288,203	848,045	1,243,605
Aspen							
Sawtimber	—	—	5,362	23,518	10,078	—	38,958
Poletimber	—	—	8,760	41,996	72,963	5,716	129,435
Sapling and seedling	—	—	—	—	25,117	18,205	43,322
Nonstocked	—	—	—	—	6,242	—	6,242
Total	—	—	14,122	65,514	114,400	23,921	217,957
Cottonwood <sup>3</sup>							
Sawtimber	—	5,503	24,840	54,937	55,556	5,690	146,526
Poletimber	—	8,439	20,369	31,386	5,716	—	65,910
Sapling and seedling	—	—	—	14,124	11,431	—	25,555
Nonstocked	—	—	—	13,813	—	—	13,813
Total	—	13,942	45,209	114,260	72,703	5,690	251,804
All types							
Sawtimber	7,893	76,542	2,400,896	5,089,764	4,455,021	1,039,068	13,069,184
Poletimber	—	19,550	156,448	804,247	1,002,781	162,663	2,145,689
Sapling and seedling	—	7,660	284,475	766,213	972,357	290,807	2,321,512
Nonstocked	—	145	32,210	158,218	688,795	565,970	1,445,338
Total	7,893	103,897	2,874,029	6,818,442	7,118,954	2,058,508	18,981,723

<sup>1</sup>Includes mountain hemlock and whitebark pine on this and subsequent tables.

<sup>2</sup>For National Forest, miscellaneous western softwoods includes juniper, mountain hemlock, and nonstocked forest land.

<sup>3</sup>Includes paper birch.

**Table 13—Area of National Forest timberland by forest type, stand-size class, and productivity class, Montana, 1989**

Forest type and stand-size class	Productivity class						Total acres
	165+	120-164	85-119	50-84	20-49	0-19	
	----- Acres -----						
Douglas-fir							
Sawtimber	—	—	501,305	1,262,090	881,129	255,542	2,900,066
Poletimber	—	—	14,745	50,514	73,146	27,095	165,500
Sapling and seedling	—	—	36,794	101,939	60,854	33,631	233,218
Nonstocked	—	—	7,538	7,885	24,519	19,274	59,216
Total	—	—	560,382	1,422,428	1,039,648	335,542	3,358,000
Western hemlock							
Sawtimber	—	—	5,477	11,267	—	—	16,744
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	907	—	907
Nonstocked	—	—	—	—	—	—	—
Total	—	—	5,477	11,267	907	—	17,651
Ponderosa pine							
Sawtimber	—	—	12,656	183,385	236,013	95,304	527,358
Poletimber	—	—	—	16,817	24,643	—	41,460
Sapling and seedling	—	—	3,401	4,891	9,352	—	17,644
Nonstocked	—	—	—	—	19,424	24,725	44,149
Total	—	—	16,057	205,093	289,432	120,029	630,611
Western white pine							
Sawtimber	—	—	27,243	4,041	—	—	31,284
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	755	—	—	—	755
Nonstocked	—	—	—	—	—	—	—
Total	—	—	27,998	4,041	—	—	32,039
Lodgepole pine							
Sawtimber	—	196	477,303	1,298,459	961,380	130,201	2,867,539
Poletimber	—	—	46,753	73,153	56,573	17,064	193,543
Sapling and seedling	—	—	27,477	96,779	96,295	27,045	247,596
Nonstocked	—	—	10,482	14,517	16,096	4,577	45,672
Total	—	196	562,015	1,482,908	1,130,344	178,887	3,354,350
Western larch							
Sawtimber	—	—	297,801	194,675	2,573	15,658	510,707
Poletimber	—	—	17,022	18,791	—	—	35,813
Sapling and seedling	—	1,548	88,828	52,724	982	2,527	146,609
Nonstocked	—	—	2,377	—	—	—	2,377
Total	—	1,548	406,028	266,190	3,555	18,185	695,506
Western redcedar							
Sawtimber	—	—	82,406	2,874	—	—	85,280
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	5,242	—	—	—	5,242
Nonstocked	—	—	—	—	—	—	—
Total	—	—	87,648	2,874	—	—	90,522
Limber pine							
Sawtimber	—	—	—	—	—	23,462	23,462
Poletimber	—	—	—	—	—	14,334	14,334
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	31,315	9,207	40,522
Total	—	—	—	—	31,315	47,003	78,318

(con.)



Table 13 (Con.)

Forest type and stand-size class	Productivity class					Total acres	
	165+	120-164	85-119	50-84	20-49		0-19
	----- Acres -----						
Grand fir							
Sawtimber	—	—	70,846	11,033	18,182	—	100,061
Poletimber	—	—	1,628	—	—	—	1,628
Sapling and seedling	—	—	12,570	1,902	—	—	14,472
Nonstocked	—	—	—	—	—	—	—
Total	—	—	85,044	12,935	18,182	—	116,161
Spruce-fir							
Sawtimber	—	—	167,958	160,069	328,081	260,395	916,503
Poletimber	—	—	755	34,053	29,068	31,339	95,215
Sapling and seedling	—	—	27,995	51,775	12,319	67,093	159,182
Nonstocked	—	—	706	4,767	3,399	7,933	16,805
Total	—	—	197,414	250,664	372,867	366,760	1,187,705
Engelmann spruce							
Sawtimber	—	—	173,887	122,062	68,733	72,191	436,873
Poletimber	—	—	4,897	23,144	—	4,465	32,506
Sapling and seedling	—	—	34,048	16,319	3,457	4,140	57,964
Nonstocked	—	—	—	3,092	14,629	—	17,721
Total	—	—	212,832	164,617	86,819	80,796	545,064
Misc. western softwoods <sup>1</sup>							
Sawtimber	—	—	—	11,308	23,266	168,571	203,145
Poletimber	—	—	1,473	—	—	53,302	54,775
Sapling and seedling	—	—	—	—	22,068	136,479	158,547
Nonstocked	—	145	4,698	89,733	242,869	489,693	827,138
Total	—	145	6,171	101,041	288,203	848,045	1,243,605
Aspen							
Sawtimber	—	—	—	1,200	4,393	—	5,593
Poletimber	—	—	—	—	771	—	771
Sapling and seedling	—	—	—	—	—	546	546
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	1,200	5,164	546	6,910
Cottonwood <sup>2</sup>							
Sawtimber	—	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—
All types							
Sawtimber	—	196	1,816,882	3,262,463	2,523,750	1,021,324	8,624,615
Poletimber	—	—	87,273	216,472	184,201	147,599	635,545
Sapling and seedling	—	1,548	237,110	326,329	206,234	271,461	1,042,682
Nonstocked	—	145	25,801	119,994	352,251	555,409	1,053,600
Total	—	1,889	2,167,066	3,925,258	3,266,436	1,995,793	11,356,442

<sup>1</sup>For National Forest, miscellaneous western softwoods includes juniper, mountain hemlock, and nonstocked forest land.<sup>2</sup>Includes paper birch.

**Table 14**—Area of other publicly owned timberland by forest type, stand-size class, and productivity class, Montana, 1989

Forest type and stand-size class	Productivity class					Total acres	
	165+	120-164	85-119	50-84	20-49		0-19
	----- Acres -----						
Douglas-fir							
Sawtimber	—	5,437	64,694	217,126	165,783	—	453,040
Poletimber	—	—	—	44,744	62,475	—	107,219
Sapling and seedling	—	—	—	15,338	42,541	—	57,879
Nonstocked	—	—	—	—	10,579	—	10,579
Total	—	5,437	64,694	277,208	281,378	—	628,717
Western hemlock							
Sawtimber	—	—	135	—	—	—	135
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	135	—	—	—	135
Ponderosa pine							
Sawtimber	2,039	7,315	3,513	58,851	247,590	—	319,308
Poletimber	—	—	—	—	72,387	—	72,387
Sapling and seedling	—	—	2,682	3,721	70,487	—	76,890
Nonstocked	—	—	—	—	35,832	1,219	37,051
Total	2,039	7,315	6,195	62,572	426,296	1,219	505,636
Western white pine							
Sawtimber	—	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—
Lodgepole pine							
Sawtimber	—	—	3,608	40,318	35,722	—	79,648
Poletimber	—	2,433	3,581	42,922	67,124	—	116,060
Sapling and seedling	—	—	—	4,405	34,685	—	39,090
Nonstocked	—	—	135	—	—	4,320	4,455
Total	—	2,433	7,324	87,645	137,531	4,320	239,253
Western larch							
Sawtimber	—	—	9,964	26,191	—	—	36,155
Poletimber	—	—	—	3,791	—	—	3,791
Sapling and seedling	—	—	—	5,932	2,380	—	8,312
Nonstocked	—	—	—	—	—	—	—
Total	—	—	9,964	35,914	2,380	—	48,258
Western redcedar							
Sawtimber	—	—	135	4,702	—	—	4,837
Poletimber	—	—	—	135	—	—	135
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	135	4,837	—	—	4,972
Limber pine							
Sawtimber	—	—	—	—	—	—	—
Poletimber	—	—	—	—	6,237	338	6,575
Sapling and seedling	—	—	—	—	—	331	331
Nonstocked	—	—	—	—	733	—	733
Total	—	—	—	—	6,970	669	7,639

(con.)

(con.)



Table 14 (Con.)

Forest type and stand-size class	Productivity class					Total acres	
	165+	120-164	85-119	50-84	20-49		0-19
	----- Acres -----						
Grand fir							
Sawtimber	—	1,844	1,723	5,426	—	—	8,993
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	2,351	—	—	—	2,351
Nonstocked	—	—	—	—	—	—	—
Total	—	1,844	4,074	5,426	—	—	11,344
Spruce-fir							
Sawtimber	—	—	12,772	42,262	18,794	6,195	80,023
Poletimber	—	—	6,713	1,752	4,405	—	12,870
Sapling and seedling	—	—	—	3,446	3,632	—	7,078
Nonstocked	—	—	—	—	—	—	—
Total	—	—	19,485	47,460	26,831	6,195	99,971
Engelmann spruce							
Sawtimber	—	—	5,061	12,059	—	—	17,120
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	5,061	12,059	—	—	17,120
Misc. western softwoods							
Sawtimber	—	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—
Aspen							
Sawtimber	—	—	—	—	—	—	—
Poletimber	—	—	82	7,743	1,220	—	9,045
Sapling and seedling	—	—	—	—	—	1,676	1,676
Nonstocked	—	—	—	—	1,220	—	1,220
Total	—	—	82	7,743	2,440	1,676	11,941
Cottonwood¹							
Sawtimber	—	—	1,723	6,514	3,023	—	11,260
Poletimber	—	29	1,248	1,522	—	—	2,799
Sapling and seedling	—	—	—	29	—	—	29
Nonstocked	—	—	—	75	—	—	75
Total	—	29	2,971	8,140	3,023	—	14,163
All types							
Sawtimber	2,039	14,596	103,328	413,449	470,912	6,195	1,010,519
Poletimber	—	2,462	11,624	102,609	213,848	338	330,881
Sapling and seedling	—	—	5,033	32,871	153,725	2,007	193,636
Nonstocked	—	—	135	75	48,364	5,539	54,113
Total	2,039	17,058	120,120	549,004	886,849	14,079	1,589,149

<sup>1</sup>Includes paper birch.

**Table 15**—Area of forest industry owned timberland by forest type, stand-size class, and productivity class, Montana, 1989

Forest type and stand-size class	Productivity class					Total acres	
	165+	120-164	85-119	50-84	20-49		0-19
	----- Acres -----						
Douglas-fir							
Sawtimber	—	12,223	83,258	284,234	94,886	—	474,601
Poletimber	—	—	6,112	67,857	50,653	—	124,622
Sapling and seedling	—	6,112	5,750	94,105	144,023	—	249,990
Nonstocked	—	—	—	—	31,890	—	31,890
Total	—	18,335	95,120	446,196	321,452	—	881,103
Western hemlock							
Sawtimber	—	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	6,111	—	—	6,111
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	6,111	—	—	6,111
Ponderosa pine							
Sawtimber	—	68	969	36,930	180	—	38,147
Poletimber	—	—	—	6,111	15	—	6,126
Sapling and seedling	—	—	—	18,783	27,468	—	46,251
Nonstocked	—	—	—	6,111	—	—	6,111
Total	—	68	969	67,935	27,663	—	96,635
Western white pine							
Sawtimber	—	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—
Lodgepole pine							
Sawtimber	—	—	15	33,400	22,279	—	55,694
Poletimber	—	—	6,112	79,642	30,816	—	116,570
Sapling and seedling	—	—	—	31,553	19,737	—	51,290
Nonstocked	—	—	—	—	—	—	—
Total	—	—	6,127	144,595	72,832	—	223,554
Western larch							
Sawtimber	—	—	25,117	18,151	—	—	43,268
Poletimber	—	—	—	17,652	—	—	17,652
Sapling and seedling	—	—	—	54,649	—	—	54,649
Nonstocked	—	—	—	—	7,731	—	7,731
Total	—	—	25,117	90,452	7,731	—	123,300
Western redcedar							
Sawtimber	—	—	6,112	7,731	—	—	13,843
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	6,112	7,731	—	—	13,843
Limber pine							
Sawtimber	—	—	—	—	5,193	—	5,193
Poletimber	—	—	—	—	67	—	67
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	—	5,260	—	5,260

(con.)



Table 15 (Con.)

Forest type and stand-size class	Productivity class					Total acres	
	165+	120-164	85-119	50-84	20-49		0-19
	----- Acres -----						
Grand fir							
Sawtimber	—	6,112	6,112	12,533	—	—	24,757
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	13,566	6,111	—	—	19,677
Nonstocked	—	—	—	12,676	—	—	12,676
Total	—	6,112	19,678	31,320	—	—	57,110
Spruce-fir							
Sawtimber	—	—	28,129	37,598	47	—	65,774
Poletimber	—	—	—	21,574	5,685	—	27,259
Sapling and seedling	—	—	—	24,538	28,043	—	52,581
Nonstocked	—	—	—	—	—	—	—
Total	—	—	28,129	83,710	33,775	—	145,614
Engelmann spruce							
Sawtimber	—	—	27,467	7,908	9,385	—	44,760
Poletimber	—	—	5,751	—	—	—	5,751
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	33,218	7,908	9,385	—	50,511
Misc. western softwoods							
Sawtimber	—	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—
Aspen							
Sawtimber	—	—	—	98	—	—	98
Poletimber	—	—	—	18	15	—	33
Sapling and seedling	—	—	—	—	82	47	129
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	116	97	47	260
Cottonwood <sup>1</sup>							
Sawtimber	—	—	—	47	14	—	61
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	47	14	—	61
All types							
Sawtimber	—	18,403	177,179	438,630	131,984	—	766,196
Poletimber	—	—	17,975	192,854	87,251	—	298,080
Sapling and seedling	—	6,112	19,316	235,850	219,353	47	480,678
Nonstocked	—	—	—	18,787	39,621	—	58,408
Total	—	24,515	214,470	886,121	478,209	47	1,603,362

<sup>1</sup>Includes paper birch.

**Table 16**—Area of nonindustrial private timberland by forest type, stand-size class, and productivity class, Montana, 1989

Forest type and stand-size class	Productivity class						Total acres
	165+	120-164	85-119	50-84	20-49	0-19	
----- Acres -----							
Douglas-fir							
Sawtimber	—	14,715	143,527	493,337	439,001	—	1,090,580
Poletimber	—	—	—	93,427	160,177	—	253,604
Sapling and seedling	—	—	9,816	45,167	77,818	—	132,801
Nonstocked	—	—	—	—	44,022	—	44,022
Total	—	14,715	153,343	631,931	721,018	—	1,521,007
Western hemlock							
Sawtimber	—	—	6,274	—	—	—	6,274
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	6,274	—	—	—	6,274
Ponderosa pine							
Sawtimber	5,854	14,719	59,455	296,570	753,948	—	1,130,546
Poletimber	—	—	—	10,438	162,575	5,869	178,882
Sapling and seedling	—	—	—	60,784	209,883	—	270,667
Nonstocked	—	—	—	5,624	187,012	5,022	197,658
Total	5,854	14,719	59,455	373,416	1,313,418	10,891	1,777,753
Western white pine							
Sawtimber	—	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—
Lodgepole pine							
Sawtimber	—	—	10,988	41,731	36,539	—	89,258
Poletimber	—	8,678	11,777	80,885	85,640	—	186,980
Sapling and seedling	—	—	7,163	16,102	19,175	—	42,440
Nonstocked	—	—	6,274	—	4,666	—	10,940
Total	—	8,678	36,202	138,718	146,020	—	329,618
Western larch							
Sawtimber	—	—	4,752	12,016	5,503	—	22,271
Poletimber	—	—	—	18,665	—	—	18,665
Sapling and seedling	—	—	—	17,063	20,570	—	37,633
Nonstocked	—	—	—	—	—	—	—
Total	—	—	4,752	47,744	26,073	—	78,569
Western redcedar							
Sawtimber	—	—	6,274	—	—	—	6,274
Poletimber	—	—	—	6,274	—	—	6,274
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	6,274	6,274	—	—	12,548
Limber pine							
Sawtimber	—	—	—	6,554	10,968	5,859	23,381
Poletimber	—	—	—	—	8,445	3,141	11,586
Sapling and seedling	—	—	—	—	14,324	1,356	15,680
Nonstocked	—	—	—	—	3,677	—	3,677
Total	—	—	—	6,554	37,414	10,356	54,324

(con.)



Table 16 (Con.)

Forest type and stand-size class	Productivity class					Total acres	
	165+	120-164	85-119	50-84	20-49		0-19
	----- Acres -----						
Grand fir							
Sawtimber	—	8,410	6,037	14,683	—	—	29,130
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	6,037	4,752	—	—	10,789
Nonstocked	—	—	—	—	—	—	—
Total	—	8,410	12,074	19,435	—	—	39,919
Spruce-fir							
Sawtimber	—	—	20,218	17,770	24,212	—	62,200
Poletimber	—	—	—	13,162	23,971	—	37,133
Sapling and seedling	—	—	—	7,163	14,809	—	21,972
Nonstocked	—	—	—	—	—	—	—
Total	—	—	20,218	38,095	62,992	—	121,305
Engelmann spruce							
Sawtimber	—	—	17,503	21,965	—	—	39,468
Poletimber	—	—	—	5,362	—	—	5,362
Sapling and seedling	—	—	—	6,037	—	—	6,037
Nonstocked	—	—	—	—	4,160	—	4,160
Total	—	—	17,503	33,364	4,160	—	55,027
Misc. western softwoods							
Sawtimber	—	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—
Aspen							
Sawtimber	—	—	5,362	22,220	5,685	—	33,267
Poletimber	—	—	8,678	34,235	70,957	5,716	119,586
Sapling and seedling	—	—	—	—	25,035	15,936	40,971
Nonstocked	—	—	—	—	5,022	—	5,022
Total	—	—	14,040	56,455	106,699	21,652	198,846
Cottonwood¹							
Sawtimber	—	5,503	23,117	48,376	52,519	5,690	135,205
Poletimber	—	8,410	19,121	29,864	5,716	—	63,111
Sapling and seedling	—	—	—	14,095	11,431	—	25,526
Nonstocked	—	—	—	13,738	—	—	13,738
Total	—	13,913	42,238	106,073	69,666	5,690	237,580
All types							
Sawtimber	5,854	43,347	303,507	975,222	1,328,375	11,549	2,667,854
Poletimber	—	17,088	39,576	292,312	517,481	14,726	881,183
Sapling and seedling	—	—	23,016	171,163	393,045	17,292	604,516
Nonstocked	—	—	6,274	19,362	248,559	5,022	279,217
Total	5,854	60,435	372,373	1,458,059	2,487,460	48,589	4,432,770

<sup>1</sup>Includes paper birch.

Table 17—Net volume of growing stock on timberland by species and diameter class, Montana, 1989

Species	Diameter class (inches at breast height)										29.0+	All classes
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9 <sup>1</sup>			
----- Million cubic feet -----												
Douglas-fir	640.8	1,010.0	1,185.9	1,248.9	1,104.6	936.1	735.1	573.8	1,045.0	271.9	8,752.1	
Ponderosa pine	126.7	287.4	358.6	422.2	407.8	326.4	240.3	192.1	430.4	219.2	3,011.1	
Western white pine	5.9	10.2	13.6	36.4	18.5	24.0	17.2	17.7	54.3	27.8	225.6	
Lodgepole pine	1,782.3	2,462.7	2,077.9	1,375.2	703.2	350.7	138.6	62.2	33.7	1.5	8,988.0	
Whitebark pine	7.1	14.5	16.4	11.0	4.6	7.6	3.8	3.7	3.6	—	72.3	
Limber pine	13.4	8.8	10.2	6.4	6.2	2.2	2.1	1.9	1.5	—	52.7	
Western larch	132.0	202.3	228.7	219.5	207.4	197.2	175.7	176.0	475.2	203.4	2,217.4	
Grand fir	207.8	315.5	295.5	251.5	187.8	149.4	91.6	62.4	84.7	10.2	1,656.4	
Subalpine fir	102.6	91.0	67.6	51.4	28.4	12.9	6.6	5.4	1.0	—	366.9	
Engelmann spruce	100.0	166.0	181.1	215.6	219.6	221.9	197.5	134.1	283.6	74.3	1,793.7	
Western hemlock	12.0	25.5	21.7	29.7	20.5	17.1	17.3	10.3	45.9	11.4	211.4	
Western redcedar	9.2	5.7	8.6	6.8	4.6	1.5	3.8	1.2	8.1	3.4	52.9	
Other western softwoods <sup>2</sup>	60.4	101.9	120.7	103.0	101.9	58.2	53.7	35.7	69.1	55.1	759.7	
Total softwoods	3,200.2	4,701.5	4,586.5	3,977.6	3,015.1	2,305.2	1,683.3	1,276.5	2,536.1	878.2	28,160.2	
Western hardwoods <sup>3</sup>	71.0	102.6	90.5	66.3	40.8	24.0	25.0	19.5	42.4	16.5	498.6	
Total hardwoods	71.0	102.6	90.5	66.3	40.8	24.0	25.0	19.5	42.4	16.5	498.6	
All species <sup>4</sup>	3,271.2	4,804.1	4,677.0	4,043.9	3,055.9	2,329.2	1,708.3	1,296.0	2,578.5	894.7	28,658.8	

<sup>1</sup>Diameter classes grouped because detail was not available from National Forest data.<sup>2</sup>For National Forests this includes juniper, alpine larch, western redcedar, whitebark pine, limber pine, mountain hemlock, and yew.<sup>3</sup>Aspen and cottonwood detail not available from the National Forest data. This detail for lands outside National Forests is available in previous reports.<sup>4</sup>Total does not match other volume tables because volume data for the 0-19 productivity class is not available from the National Forest data.



**Table 18**—Net volume of sawtimber (International 1/4-inch rule) on timberland by species and diameter class, Montana, 1989

Species	Diameter class (inches at breast height)								29.0+	All classes
	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 28.9 <sup>1</sup>			
----- Million board feet, International 1/4-inch rule -----										
Douglas-fir	4,156.5	5,529.8	5,212.9	4,634.2	3,761.9	2,941.6	5,443.5	1,413.7	33,094.1	
Ponderosa pine	1,070.7	1,670.3	1,953.3	1,744.2	1,344.5	1,107.0	2,528.0	1,340.2	12,758.2	
Western white pine	61.5	173.8	85.7	112.3	77.7	87.1	289.5	145.1	1,032.7	
Lodgepole pine	7,512.8	6,518.6	3,304.4	1,616.5	620.2	274.8	154.5	7.3	20,009.1	
Whitebark pine	72.5	67.0	27.9	44.1	21.4	20.7	20.1	—	273.7	
Limber pine	45.7	41.6	37.8	13.3	12.2	10.7	8.6	—	169.9	
Western larch	965.3	1,210.9	1,153.6	1,088.9	974.2	975.6	2,536.9	967.8	9,873.2	
Grand fir	1,149.9	1,246.2	915.4	731.5	436.4	294.6	382.8	41.9	5,198.7	
Subalpine fir	266.4	268.8	149.8	68.0	34.3	28.1	5.8	—	821.2	
Engelmann spruce	751.4	1,170.5	1,181.3	1,222.2	1,104.0	757.2	1,646.3	406.2	8,239.1	
Western hemlock	82.2	114.0	84.3	68.9	57.3	30.8	134.5	34.1	606.1	
Western redcedar	38.2	33.8	23.2	7.2	18.5	5.5	37.6	15.6	179.6	
Other western softwoods <sup>2</sup>	254.9	344.5	391.5	237.9	223.7	143.5	237.6	140.7	1,974.3	
Total softwoods	16,428.0	18,389.8	14,521.1	11,589.2	8,686.3	6,677.2	13,425.7	4,512.6	94,229.9	
Western hardwoods <sup>3</sup>	XXXXX <sup>4</sup>	338.4	207.7	121.1	119.3	91.7	193.2	76.2	1,147.6	
Total hardwoods	XXXXX	338.4	207.7	121.1	119.3	91.7	193.2	76.2	1,147.6	
All species <sup>5</sup>	16,428.0	18,728.2	14,728.8	11,710.3	8,805.6	6,768.9	13,618.9	4,588.8	95,377.5	

<sup>1</sup>Diameter classes grouped because detail was not available from National Forest data.

<sup>2</sup>For National Forests, this includes juniper, alpine larch, western redcedar, whitebark pine, limber pine, mountain hemlock, and yew.

<sup>3</sup>Aspen and cottonwood detail not available from the National Forest data. This detail for lands outside National Forests is available in previous reports.

<sup>4</sup>Hardwoods are not considered sawtimber until they are 11 inches d.b.h.

<sup>5</sup>Total does not match other volume tables because volume data for the 0-19 productivity class is not available from the National Forest data.

**Table 19**—Net volume of sawtimber (Scribner rule) on timberland by species and diameter class, Montana, 1989

Species	Diameter class (inches at breast height)								29.0+	All classes
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9 <sup>1</sup>			
----- Million board feet, Scribner rule -----										
Douglas-fir	3,699.3	4,921.5	4,639.5	4,124.4	3,348.1	2,618.0	4,844.7	1,258.2	29,453.7	
Ponderosa pine	952.9	1,486.6	1,738.4	1,552.4	1,196.6	985.2	2,249.9	1,192.8	11,354.8	
Western white pine	54.7	154.7	76.3	99.9	69.2	77.5	257.7	129.1	919.1	
Lodgepole pine	6,686.4	5,801.6	2,940.9	1,438.7	552.0	244.6	137.5	6.5	17,808.2	
Whitebark pine	64.5	59.6	24.8	39.3	19.1	18.4	17.9	—	243.6	
Limber pine	40.7	37.0	33.6	11.8	10.9	9.5	7.7	—	151.2	
Western larch	859.1	1,077.7	1,026.7	969.1	867.0	868.3	2,257.8	861.3	8,787.0	
Grand fir	1,023.4	1,109.1	814.7	651.0	388.4	262.2	340.7	37.3	4,626.8	
Subalpine fir	237.1	239.3	133.3	60.5	30.5	25.0	5.2	—	730.9	
Engelmann spruce	668.7	1,041.7	1,051.4	1,087.8	982.6	673.9	1,465.2	361.5	7,332.8	
Western hemlock	73.2	101.5	75.0	61.3	51.0	27.4	119.7	30.3	539.4	
Western redcedar	34.0	30.1	20.6	6.4	16.5	4.9	33.5	13.9	159.9	
Other western softwoods <sup>2</sup>	226.9	306.6	348.4	211.7	199.1	127.7	211.5	125.2	1,757.1	
Total softwoods	14,620.9	16,367.0	12,923.6	10,314.3	7,731.0	5,942.6	11,949.0	4,016.1	83,864.5	
Western hardwoods <sup>3</sup>	XXXXX <sup>4</sup>	301.2	184.9	107.8	106.2	81.6	171.9	67.8	1,021.4	
Total hardwoods	XXXXX	301.2	184.9	107.8	106.2	81.6	171.9	67.8	1,021.4	
All species <sup>5</sup>	14,620.9	16,668.2	13,108.5	10,422.1	7,837.2	6,024.2	12,120.9	4,083.9	84,885.9	

<sup>1</sup>Diameter classes grouped because detail was not available from National Forest data.

<sup>2</sup>For National Forests this includes juniper, alpine larch, western redcedar, whitebark pine, limber pine, mountain hemlock, and yew.

<sup>3</sup>Aspen and cottonwood detail not available from the National Forest data. This detail for lands outside National Forests is available in previous reports.

<sup>4</sup>Hardwoods are not considered sawtimber until they are 11 inches d.b.h.

<sup>5</sup>Total does not match other volume tables because volume data for the 0-19 productivity class is not available from the National Forest data.



**Table 20**—Net volume of growing stock on timberland by owner group, forest type, and stand-size class, Montana, 1989

Owner group	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand cubic feet -----						
National Forest	Douglas-fir	6,788,629	161,044	35,880	15,697	7,001,250
	Western hemlock	83,055	—	—	—	83,055
	Ponderosa pine	797,300	40,744	8,665	13,110	859,819
	Western white pine	159,827	—	—	—	159,827
	Lodgepole pine	6,787,281	312,343	56,467	5,292	7,161,383
	Western larch	1,529,698	25,345	12,408	—	1,567,451
	Western redcedar	354,260	—	358	—	354,618
	Limber pine	21,225	22,108	—	35,991	79,324
	Grand fir	379,906	2,923	1,905	—	384,734
	Spruce-fir	1,966,153	175,612	15,165	6,376	2,163,306
	Engelmann spruce	1,120,290	48,477	3,699	34,349	1,206,815
	Misc. western softwoods <sup>1</sup>	289,588	54,967	22,628	577,311	944,494
	Aspen	4,251	832	96	—	5,179
	Cottonwood <sup>2</sup>	—	—	—	—	—
	All types	20,281,463	844,395	157,271	688,126	21,971,255
Other public	Douglas-fir	833,494	158,379	19,240	221	1,011,334
	Western hemlock	180	—	—	—	180
	Ponderosa pine	259,070	32,878	28,334	3,334	323,616
	Western white pine	—	—	—	—	—
	Lodgepole pine	222,184	241,788	11,130	38	475,140
	Western larch	102,043	7,091	3,029	—	112,163
	Western redcedar	18,838	307	—	—	19,145
	Limber pine	—	2,372	—	—	2,372
	Grand fir	27,973	—	2,605	—	30,578
	Spruce-fir	247,707	28,698	2,881	—	279,286
	Engelmann spruce	50,681	—	—	—	50,681
	Misc. western softwoods <sup>1</sup>	—	—	—	—	—
	Aspen	—	10,872	118	—	10,990
	Cottonwood <sup>2</sup>	18,458	1,931	17	8	20,414
	All types	1,780,628	484,316	67,354	3,601	2,335,899
Forest industry	Douglas-fir	805,890	159,463	70,264	1,485	1,037,102
	Western hemlock	—	—	—	—	—
	Ponderosa pine	46,113	7,091	4,538	317	58,059
	Western white pine	—	—	—	—	—
	Lodgepole pine	96,943	276,209	16,807	—	389,959
	Western larch	117,376	28,135	18,960	402	164,873
	Western redcedar	36,264	—	—	—	36,264
	Limber pine	2,200	33	—	—	2,233
	Grand fir	106,100	—	5,696	—	111,796
	Spruce-fir	196,221	42,620	3,903	—	242,744
	Engelmann spruce	106,131	12,715	—	—	118,846
	Misc. western softwoods <sup>1</sup>	—	—	—	—	—
	Aspen	199	40	66	—	305
	Cottonwood <sup>2</sup>	55	—	—	—	55
	All types	1,513,492	526,306	120,234	2,204	2,162,236 (con.)

Table 20 (Con.)

Owner group	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand cubic feet -----						
Nonindustrial private	Douglas-fir	1,717,221	234,383	34,777	3,302	1,989,683
	Western hemlock	8,326	—	—	—	8,326
	Ponderosa pine	1,200,497	108,310	82,577	14,601	1,405,985
	Western white pine	—	—	—	—	—
	Lodgepole pine	235,023	431,334	21,677	2,382	690,416
	Western larch	51,380	46,863	7,301	—	105,544
	Western redcedar	17,212	14,225	—	—	31,437
	Limber pine	13,111	4,414	1,609	—	19,134
	Grand fir	83,328	—	4,046	—	87,374
	Spruce-fir	163,477	37,555	3,525	—	204,557
	Engelmann spruce	88,655	5,480	323	—	94,458
	Misc. western softwoods <sup>1</sup>	—	—	—	—	—
	Aspen	59,712	140,590	10,352	—	210,654
	Cottonwood <sup>2</sup>	139,916	81,153	11,116	1,119	233,304
	All types	3,777,858	1,104,307	177,303	21,404	5,080,872
Total	Douglas-fir	10,145,234	713,269	160,161	20,705	11,039,369
	Western hemlock	91,561	—	—	—	91,561
	Ponderosa pine	2,302,980	189,023	124,114	31,362	2,647,479
	Western white pine	159,827	—	—	—	159,827
	Lodgepole pine	7,341,431	1,261,674	106,081	7,712	8,716,898
	Western larch	1,800,497	107,434	41,698	402	1,950,031
	Western redcedar	426,574	14,532	358	—	441,464
	Limber pine	36,536	28,927	1,609	35,991	103,063
	Grand fir	597,307	2,923	14,252	—	614,482
	Spruce-fir	2,573,558	284,485	25,474	6,376	2,889,893
	Engelmann spruce	1,365,757	66,672	4,022	34,349	1,470,800
	Misc. western softwoods <sup>1</sup>	289,588	54,967	22,628	577,311	944,494
	Aspen	64,162	152,334	10,632	—	227,128
	Cottonwood <sup>2</sup>	158,429	83,084	11,133	1,127	253,773
	All types	27,353,441	2,959,324	522,162	715,335	31,550,262

<sup>1</sup>For National Forest, miscellaneous western softwoods includes juniper, mountain hemlock, and nonstocked forest land.

<sup>2</sup>Includes paper birch.



**Table 21**—Net volume of sawtimber (International ¼-inch rule) on timberland by owner group, forest type, and stand-size class, Montana, 1989

Owner group	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand board feet, International 1/4-inch rule -----						
National Forest	Douglas-fir	24,707,274	401,753	122,151	40,846	25,272,024
	Western hemlock	314,311	—	—	—	314,311
	Ponderosa pine	2,694,763	77,374	36,173	45,754	2,854,064
	Western white pine	682,288	—	—	—	682,288
	Lodgepole pine	16,142,262	400,476	107,208	9,970	16,659,916
	Western larch	5,683,534	21,579	39,218	—	5,744,331
	Western redcedar	1,308,999	—	1,365	—	1,310,364
	Limber pine	50,471	21,157	103,623	—	175,251
	Grand fir	1,336,361	—	7,476	—	1,343,837
	Spruce-fir	7,087,023	462,922	48,646	16,131	7,614,722
	Engelmann spruce	4,622,081	143,587	13,834	155,974	4,935,476
	Misc. western softwoods <sup>1</sup>	891,324	127,280	59,963	2,026,242	3,104,809
	Aspen	7,784	—	—	—	7,784
	Cottonwood <sup>2</sup>	—	—	—	—	—
		All types	65,528,475	1,656,128	539,657	2,294,917
Other public	Douglas-fir	3,672,131	281,433	77,323	99	4,030,986
	Western hemlock	924	—	—	—	924
	Ponderosa pine	1,074,228	60,376	99,423	11,449	1,245,476
	Western white pine	—	—	—	—	—
	Lodgepole pine	908,033	405,337	14,901	215	1,328,486
	Western larch	474,133	10,825	14,395	—	499,353
	Western redcedar	94,201	414	—	—	94,615
	Limber pine	—	1,122	—	—	1,122
	Grand fir	116,476	—	12,366	—	128,842
	Spruce-fir	1,034,274	53,021	6,354	—	1,093,649
	Engelmann spruce	198,573	—	—	—	198,573
	Misc. western softwoods <sup>1</sup>	—	—	—	—	—
	Aspen	—	4,629	—	—	4,629
	Cottonwood <sup>2</sup>	69,529	1,575	19	36	71,159
		All types	7,642,502	818,732	224,781	11,799
Forest industry	Douglas-fir	3,503,478	328,006	232,614	5,186	4,069,284
	Western hemlock	—	—	—	—	—
	Ponderosa pine	235,801	13,043	14,717	952	264,513
	Western white pine	—	—	—	—	—
	Lodgepole pine	298,559	319,335	26,036	—	643,930
	Western larch	515,939	43,245	92,828	—	652,012
	Western redcedar	171,292	—	—	—	171,292
	Limber pine	13,384	65	—	—	13,449
	Grand fir	434,512	—	8,799	—	443,311
	Spruce-fir	809,814	99,880	7,261	—	916,955
	Engelmann spruce	455,973	31,620	—	—	487,593
	Misc. western softwoods <sup>1</sup>	—	—	—	—	—
	Aspen	512	38	150	—	700
	Cottonwood <sup>2</sup>	179	—	—	—	179
		All types	6,439,443	835,232	382,405	6,138
						(con.)

Table 21 (Con.)

Owner group	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand board feet, International 1/4-inch rule -----						
Nonindustrial private	Douglas-fir	7,087,895	424,315	163,373	10,081	7,685,664
	Western hemlock	42,818	—	—	—	42,818
	Ponderosa pine	5,234,078	211,836	332,487	58,262	5,836,663
	Western white pine	—	—	—	—	—
	Lodgepole pine	885,095	633,090	37,707	12,550	1,568,442
	Western larch	256,077	81,495	13,860	—	351,432
	Western redcedar	60,761	19,202	—	—	79,963
	Limber pine	68,345	8,127	6,407	—	82,879
	Grand fir	296,422	—	15,069	—	311,491
	Spruce-fir	670,958	66,523	6,078	—	743,559
	Engelmann spruce	362,357	12,877	—	—	375,234
	Misc. western softwoods <sup>1</sup>	—	—	—	—	—
	Aspen	208,959	187,711	14,206	—	410,876
	Cottonwood <sup>2</sup>	580,537	155,932	6,979	5,263	748,711
	All types	15,754,302	1,801,108	596,166	86,156	18,237,732
Total	Douglas-fir	38,970,778	1,435,507	595,461	56,212	41,057,958
	Western hemlock	358,053	—	—	—	358,053
	Ponderosa pine	9,238,870	362,629	482,800	116,417	10,200,716
	Western white pine	682,288	—	—	—	682,288
	Lodgepole pine	18,233,949	1,758,238	185,852	22,735	20,200,774
	Western larch	6,929,683	157,144	160,301	—	7,247,128
	Western redcedar	1,635,253	19,616	1,365	—	1,656,234
	Limber pine	132,200	30,471	110,030	—	272,701
	Grand fir	2,183,771	—	43,710	—	2,227,481
	Spruce-fir	9,602,069	682,346	68,339	16,131	10,368,885
	Engelmann spruce	5,638,984	188,084	13,834	155,974	5,996,876
	Misc. western softwoods <sup>1</sup>	891,324	127,280	59,963	2,026,242	3,104,809
	Aspen	217,255	192,378	14,356	—	423,989
	Cottonwood <sup>2</sup>	650,245	157,507	6,998	5,299	820,049
	All types	95,364,722	5,111,200	1,743,009	2,399,010	104,617,941

<sup>1</sup>For National Forest, miscellaneous western softwoods includes juniper, mountain hemlock, and nonstocked forest land.

<sup>2</sup>Includes paper birch.



**Table 22**—Net volume of sawtimber (Scribner rule) on timberland by owner group, forest type, and stand-size class, Montana, 1989

Owner group	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand board feet, Scribner rule -----						
National Forest	Douglas-fir	21,989,474	357,560	108,714	36,353	22,492,101
	Western hemlock	279,737	—	—	—	279,737
	Ponderosa pine	2,398,339	68,863	32,194	40,721	2,540,117
	Western white pine	607,236	—	—	—	607,236
	Lodgepole pine	14,366,614	356,423	95,415	8,873	14,827,325
	Western larch	5,058,345	19,205	34,904	—	5,112,454
	Western redcedar	1,165,010	—	1,214	—	1,166,224
	Limber pine	44,919	18,830	—	92,225	155,974
	Grand fir	1,189,361	—	6,654	—	1,196,015
	Spruce-fir	6,307,450	412,000	43,296	14,357	6,777,103
	Engelmann spruce	4,113,652	127,793	12,312	138,817	4,392,574
	Misc. western softwoods <sup>1</sup>	793,278	113,279	53,367	1,803,356	2,763,280
	Aspen	6,927	—	—	—	6,927
	Cottonwood <sup>2</sup>	—	—	—	—	—
		All types	58,320,342	1,473,953	388,070	2,134,702
Other public	Douglas-fir	3,057,713	221,401	60,691	79	3,339,884
	Western hemlock	721	—	—	—	721
	Ponderosa pine	877,385	45,308	81,091	9,267	1,013,051
	Western white pine	—	—	—	—	—
	Lodgepole pine	764,645	337,000	11,774	180	1,113,599
	Western larch	399,799	8,544	12,298	—	420,641
	Western redcedar	77,619	322	—	—	77,941
	Limber pine	—	673	—	—	673
	Grand fir	98,303	—	10,196	—	108,499
	Spruce-fir	878,066	44,484	5,241	—	927,791
	Engelmann spruce	166,544	—	—	—	166,544
	Misc. western softwoods <sup>1</sup>	—	—	—	—	—
	Aspen	—	3,769	—	—	3,769
	Cottonwood <sup>2</sup>	58,368	1,265	17	28	59,678
		All types	6,379,163	662,766	181,308	9,554
Forest industry	Douglas-fir	2,942,749	256,662	188,113	4,206	3,391,730
	Western hemlock	—	—	—	—	—
	Ponderosa pine	194,316	8,907	10,628	848	214,699
	Western white pine	—	—	—	—	—
	Lodgepole pine	248,323	268,670	21,238	—	538,231
	Western larch	424,474	32,573	79,070	—	536,117
	Western redcedar	144,950	—	—	—	144,950
	Limber pine	11,442	48	—	—	11,490
	Grand fir	372,837	—	6,951	—	379,788
	Spruce-fir	689,668	79,299	5,185	—	774,152
	Engelmann spruce	386,934	27,103	—	—	414,037
	Misc. western softwoods <sup>1</sup>	—	—	—	—	—
	Aspen	427	31	119	—	577
	Cottonwood <sup>2</sup>	152	—	—	—	152
		All types	5,416,272	673,293	311,304	5,054

(con.)

(con.)

Table 22 (Con.)

Owner group	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand board feet, Scribner rule -----						
Nonindustrial private	Douglas-fir	5,787,721	331,765	132,315	7,624	6,259,425
	Western hemlock	33,429	—	—	—	33,429
	Ponderosa pine	4,322,849	164,797	276,190	48,336	4,812,172
	Western white pine	—	—	—	—	—
	Lodgepole pine	746,322	527,181	32,243	10,486	1,316,232
	Western larch	216,681	65,391	11,105	—	293,177
	Western redcedar	47,503	14,929	—	—	62,432
	Limber pine	53,854	5,999	4,375	—	64,228
	Grand fir	246,926	—	11,562	—	258,488
	Spruce-fir	565,373	54,075	4,326	—	623,774
	Engelmann spruce	301,819	10,683	—	—	312,502
	Misc. western softwoods <sup>1</sup>	—	—	—	—	—
	Aspen	176,303	152,424	11,239	—	339,966
	Cottonwood <sup>2</sup>	499,776	128,007	6,063	4,174	638,020
	All types	12,998,556	1,455,251	489,418	70,620	15,013,845
Total	Douglas-fir	33,777,657	1,167,388	489,833	48,262	35,483,140
	Western hemlock	313,887	—	—	—	313,887
	Ponderosa pine	7,792,889	287,875	400,103	99,172	8,580,039
	Western white pine	607,236	—	—	—	607,236
	Lodgepole pine	16,125,904	1,489,274	160,670	19,539	17,795,387
	Western larch	6,099,299	125,713	137,377	—	6,362,389
	Western redcedar	1,435,082	15,251	1,214	—	1,451,547
	Limber pine	110,215	25,550	4,375	92,225	232,365
	Grand fir	1,907,427	—	35,363	—	1,942,790
	Spruce-fir	8,440,557	589,858	58,048	14,357	9,102,820
	Engelmann spruce	4,968,949	165,579	12,312	138,817	5,285,657
	Misc. western softwoods <sup>1</sup>	793,278	113,279	53,367	1,803,356	2,763,280
	Aspen	183,657	156,224	11,358	—	351,239
	Cottonwood <sup>2</sup>	558,296	129,272	6,080	4,202	697,850
	All types	83,114,333	4,265,263	1,370,100	2,219,930	90,969,626

<sup>1</sup>For National Forest, miscellaneous western softwoods includes juniper, mountain hemlock, and nonstocked forest land.

<sup>2</sup>Includes paper birch.



## Growth

**Table 23**—Net annual growth of growing stock on timberland by forest type and owner group, Montana, 1988

Forest type	Owner group						Total
	National Forest	Other public			Forest industry	Nonindustrial private	
		State	Other	Total other public			
----- Thousand cubic feet -----							
Douglas-fir	131,222	14,988	8,173	23,161	25,019	52,634	232,036
Western hemlock	1,301	—	9	9	—	420	1,730
Ponderosa pine	23,038	3,887	4,891	8,778	2,865	34,352	69,033
Western white pine	3,579	—	—	—	—	—	3,579
Lodgepole pine	135,925	3,438	5,877	9,315	7,011	15,312	167,563
Western larch	42,034	1,159	8	1,167	1,171	3,061	47,433
Western redcedar	6,391	138	34	172	1,228	1,587	9,378
Limber pine	3,458	12	32	44	-915	580	3,167
Grand fir	38,882	596	13	609	3,406	2,573	45,470
Spruce-fir	9,940	1,362	1,803	3,165	7,971	3,602	24,678
Engelmann spruce	19,659	1,087	176	1,263	1,586	542	23,050
Misc. western softwoods <sup>1</sup>	16,830	—	—	—	—	—	16,830
Aspen	( <sup>2</sup> )	117	904	1,021	5	4,663	5,689
Cottonwood <sup>3</sup>	( <sup>2</sup> )	455	126	581	1	7,771	8,353
All classes	432,259	27,239	22,046	49,285	49,348	127,097	657,989

<sup>1</sup>For National Forest, miscellaneous western softwoods includes juniper, mountain hemlock, and nonstocked forest land.

<sup>2</sup>Growth is not measured on these forest types on National Forest System lands because they are not important commercial types.

<sup>3</sup>Includes paper birch.

## Mortality

**Table 24**—Annual mortality of growing stock on timberland by forest type and owner group, Montana, 1988

Forest type	Owner group						Total
	National Forest	Other public			Forest industry	Nonindustrial private	
		State	Other	Total other public			
----- <i>Thousand cubic feet</i> -----							
Douglas-fir	32,964	2,922	609	3,531	7,571	6,502	50,568
Western hemlock	309	—	—	—	—	—	309
Ponderosa pine	414	545	1,306	1,851	71	11,768	14,104
Western white pine	324	—	—	—	—	—	324
Lodgepole pine	59,048	1,653	2,595	4,248	6,875	6,411	76,582
Western larch	8,354	1,847	2	1,849	4,584	507	15,294
Western redcedar	3,052	102	—	102	505	—	3,659
Limber pine	116	19	57	76	939	—	1,131
Grand fir	1,065	442	2	444	204	748	2,461
Spruce-fir	9,802	2,811	1,763	4,574	1,644	1,238	17,258
Engelmann spruce	6,816	128	1	129	1,878	1,994	10,817
Misc. western softwoods <sup>1</sup>	3,255	—	—	—	—	—	3,255
Aspen	( <sup>2</sup> )	28	22	50	3	2,548	2,601
Cottonwood <sup>3</sup>	( <sup>2</sup> )	28	11	39	1	1,016	1,056
All classes	125,519	10,525	6,368	16,893	24,275	32,732	199,419

<sup>1</sup>For National Forest, miscellaneous western softwoods includes juniper, mountain hemlock, and nonstocked forest land.

<sup>2</sup>Mortality is not measured on these forest types on National Forest System lands because they are not important commercial types.

<sup>3</sup>Includes paper birch.

## Removals

**Table 25**—Annual timber removals from growing stock and sawtimber on timberland by owner group and removal type, Montana, 1988

Owner group	Removal type			Total
	Sawlogs	Other products	Logging residue	
----- Thousand cubic feet -----				
National Forest	80,081	5,848	10,801	96,730
Other public				
State	6,129	1,486	938	8,553
Other	863	705	192	1,760
Total other public	6,992	2,191	1,130	10,313
Forest industry	40,521	32,841	9,028	82,390
Private	47,711	6,052	6,532	60,295
Total	175,305	46,932	27,491	249,728
----- Thousand board feet, International 1/4-inch rule -----				
National Forest	472,768	25,590	17,919	516,277
Other public				
State	36,181	8,157	1,585	45,923
Other	5,097	4,161	331	9,589
Total other public	41,278	12,318	1,916	55,512
Forest industry	239,219	192,888	15,474	447,581
Private	281,668	25,911	10,743	318,322
Total	1,034,933	256,707	46,052	1,337,692
----- Thousand board feet, Scribner rule -----				
National Forest	402,287	21,775	15,644	439,706
Other public				
State	30,787	6,941	1,387	39,115
Other	4,337	3,541	290	8,168
Total other public	35,124	10,482	1,677	47,283
Forest industry	203,556	164,132	13,543	381,231
Private	239,677	22,048	9,385	271,110
Total	880,644	218,437	40,249	1,139,330



**Table 26**—Annual timber removals from growing stock and sawtimber on timberland by species and owner group, Montana, 1988

Species	Owner group						Total
	National Forest	Other public		Total other public	Forest industry	Private	
		State	Other				
----- Thousand cubic feet -----							
True fir	4,681	427	11	438	3,477	2,440	11,036
Larch	12,509	1,433	191	1,624	18,737	3,982	36,852
Engelmann spruce	8,493	561	38	599	5,794	3,866	18,752
Lodgepole pine	32,737	1,645	548	2,193	11,537	16,934	63,401
Whitebark/limber pine	26	2	6	8	62	16	112
Western white pine	1,158	78	—	78	625	451	2,312
Ponderosa pine	12,049	1,740	230	1,970	10,402	17,055	41,476
Douglas-fir	22,917	2,592	736	3,328	30,729	14,305	71,279
Western redcedar	2,066	60	—	60	913	485	3,524
Western hemlock	94	15	—	15	114	197	420
Cottonwood	—	—	—	—	—	564	564
Total	96,730	8,553	1,760	10,313	82,390	60,295	249,728
----- Thousand board feet, International 1/4-inch rule -----							
True fir	25,484	2,326	64	2,390	18,945	13,306	60,125
Larch	68,138	7,810	1,040	8,850	102,080	21,726	200,794
Engelmann spruce	46,225	3,055	205	3,260	31,571	21,061	102,117
Lodgepole pine	168,243	8,287	2,988	11,275	61,559	81,775	322,852
Whitebark/limber pine	141	14	32	46	337	86	610
Western white pine	6,309	424	—	424	3,404	2,460	12,597
Ponderosa pine	65,328	9,472	1,249	10,721	56,671	92,866	225,586
Douglas-fir	124,646	14,128	4,011	18,139	167,421	77,997	388,203
Western redcedar	11,251	327	—	327	4,973	2,642	19,193
Western hemlock	512	80	—	80	620	1,075	2,287
Cottonwood	—	—	—	—	—	3,328	3,328
Total	516,277	45,923	9,589	55,512	447,581	318,322	1,337,692
----- Thousand board feet, Scribner rule -----							
True fir	21,707	1,981	54	2,035	16,137	11,334	51,213
Larch	58,038	6,653	886	7,539	86,949	18,505	171,031
Engelmann spruce	39,372	2,602	175	2,777	26,891	17,939	86,979
Lodgepole pine	143,263	7,057	2,545	9,602	52,426	69,643	274,934
Whitebark/limber pine	120	12	28	40	287	73	520
Western white pine	5,373	361	—	361	2,900	2,096	10,730
Ponderosa pine	55,644	8,068	1,064	9,132	48,271	79,087	192,134
Douglas-fir	106,170	12,034	3,416	15,450	142,606	66,436	330,662
Western redcedar	9,583	279	—	279	4,236	2,250	16,348
Western hemlock	436	68	—	68	528	916	1,948
Cottonwood	—	—	—	—	—	2,831	2,831
Total	439,706	39,115	8,168	47,283	381,231	271,110	1,139,330

**Table 27**—Annual timber removals from growing stock and sawtimber on timberland by species and removal type, Montana, 1988

Species	Removal type			Total
	Sawlogs	Other products	Logging residue	
----- Thousand cubic feet -----				
True fir	8,324	1,509	1,203	11,036
Larch	17,561	15,279	4,012	36,852
Engelmann spruce	15,271	1,428	2,053	18,752
Lodgepole pine	51,572	4,568	7,261	63,401
Whitebark/limber pine	100	—	12	112
Western white pine	2,055	5	252	2,312
Ponderosa pine	34,073	2,884	4,519	41,476
Douglas-fir	42,937	20,593	7,749	71,279
Western redcedar	3,037	102	385	3,524
Western hemlock	375	—	45	420
Cottonwood	—	564	—	564
Total	175,305	46,932	27,491	249,728
----- Thousand board feet, International 1/4-inch rule -----				
True fir	49,145	8,909	2,071	60,125
Larch	103,673	90,200	6,921	200,794
Engelmann spruce	90,156	8,431	3,530	102,117
Lodgepole pine	304,464	7,119	11,269	322,852
Whitebark/limber pine	589	—	21	610
Western white pine	12,132	30	435	12,597
Ponderosa pine	201,154	16,742	7,690	225,586
Douglas-fir	253,484	121,346	13,373	388,203
Western redcedar	17,928	602	663	19,193
Western hemlock	2,208	—	79	2,287
Cottonwood	—	3,328	—	3,328
Total	1,034,933	256,707	46,052	1,337,692
----- Thousand board feet, Scribner rule -----				
True fir	41,819	7,581	1,813	51,213
Larch	88,218	76,752	6,061	171,031
Engelmann spruce	76,715	7,174	3,090	86,979
Lodgepole pine	259,074	6,058	9,802	274,934
Whitebark/limber pine	501	—	19	520
Western white pine	10,323	26	381	10,730
Ponderosa pine	171,166	14,246	6,722	192,134
Douglas-fir	215,694	103,256	11,712	330,662
Western redcedar	15,255	513	580	16,348
Western hemlock	1,879	—	69	1,948
Cottonwood	—	2,831	—	2,831
Total	880,644	218,437	40,249	1,139,330

**Table 28**—Annual timber removals from growing stock and sawtimber on timberland by county, Montana, 1988

County	Growing stock	Sawtimber	
		<i>Thousand board feet International 1/4-inch rule</i>	<i>Thousand board feet Scribner rule</i>
	<i>Thousand cubic feet</i>		
Beaverhead	3,264	17,410	14,828
Big Horn	2,254	12,237	10,422
Broadwater	593	2,747	2,340
Carbon	53	301	256
Carter	519	2,826	2,407
Cascade	933	5,075	4,323
Chouteau	1,389	7,558	6,438
Custer	79	428	365
Deer Lodge	1,358	7,272	6,194
Fergus	2,305	11,912	10,146
Flathead	50,835	271,929	231,604
Gallatin	5,779	30,218	25,736
Granite	6,153	33,083	28,179
Hill	157	852	726
Jefferson	1,792	9,291	7,914
Judith Basin	72	56	47
Lake	11,972	65,068	55,422
Lewis and Clark	3,845	18,832	16,040
Lincoln	61,726	331,173	282,047
Madison	3,537	19,219	16,369
Meagher	2,997	16,291	13,876
Mineral	8,610	46,457	39,571
Missoula	29,957	161,999	137,986
Musselshell	765	4,161	3,544
Park	3,136	16,779	14,291
Powder River	2,093	11,253	9,580
Powell	11,926	64,626	55,047
Ravalli	8,349	45,688	38,910
Rosebud	1,568	8,390	7,142
Sanders	19,148	100,872	85,920
Silver Bow	576	3,001	2,556
Stillwater	15	90	77
Sweet Grass	1,520	8,129	6,924
Treasure	283	1,543	1,314
Wheatland	170	926	789
Total	249,728	1,337,692	1,139,330



**Table 29**—Annual timber removals from growing stock on timberland by county and owner group, Montana, 1988

County	Owner group				Total
	National Forest	Other public	Forest industry	Nonindustrial private	
----- Thousand cubic feet -----					
Beaverhead	2,086	506	—	672	3,264
Big Horn	54	—	—	2,200	2,254
Broadwater	280	—	—	313	593
Carbon	30	—	—	22	52
Carter	212	—	—	306	518
Cascade	( <sup>1</sup> )	( <sup>1</sup> )	—	933	933
Chouteau	—	—	—	1,389	1,389
Custer	—	—	—	79	79
Dawson	—	—	—	—	—
Deer Lodge	15	208	4	1,130	1,357
Fergus	371	86	—	1,849	2,306
Flathead	17,394	1,875	27,212	4,354	50,835
Gallatin	958	27	3,752	1,041	5,778
Granite	2,489	187	1,942	1,534	6,152
Hill	—	—	—	157	157
Jefferson	620	58	—	1,114	1,792
Judith Basin	68	—	—	4	72
Lake	925	1,672	2,352	7,023	11,972
Lewis and Clark	1,909	145	183	1,608	3,845
Lincoln	37,401	1,383	14,449	8,494	61,727
Madison	923	475	1,981	159	3,538
Meagher	1,009	277	—	1,711	2,997
Mineral	5,916	143	473	2,077	8,609
Missoula	3,107	1,957	18,414	6,479	29,957
Musselshell	—	64	—	701	765
Park	502	—	556	2,078	3,136
Powder River	1,047	8	—	1,039	2,094
Powell	4,817	342	4,714	2,053	11,926
Ravalli	5,548	61	170	2,570	8,349
Rosebud	—	28	—	1,541	1,569
Sanders	7,554	786	6,186	4,622	19,148
Silver Bow	53	—	—	523	576
Stillwater	—	—	—	15	15
Sweet Grass	1,444	—	—	76	1,520
Treasure	—	24	—	260	284
Wheatland	—	—	—	170	170
Total	96,732	10,312	82,388	60,296	249,728

<sup>1</sup>Less than 500 cubic feet.

**Table 30**—Annual timber removals from sawtimber (International ¼-inch rule) on timberland by county and owner group, Montana, 1988

County	Owner group				Total
	National Forest	Other public	Forest industry	Nonindustrial private	
----- Thousand board feet, International ¼-inch rule -----					
Beaverhead	11,006	2,749	—	3,655	17,410
Big Horn	293	—	—	11,944	12,237
Broadwater	1,378	—	—	1,369	2,747
Carbon	180	—	—	122	302
Carter	1,158	—	—	1,668	2,826
Cascade	( <sup>1</sup> )	( <sup>1</sup> )	—	5,075	5,075
Chouteau	—	—	—	7,558	7,558
Custer	—	—	—	428	428
Dawson	—	—	—	—	—
Deer Lodge	7	1,134	—	6,131	7,272
Fergus	1,432	467	—	10,013	11,912
Flathead	93,836	9,901	148,054	20,139	271,930
Gallatin	5,203	—	19,952	5,062	30,217
Granite	13,192	993	10,570	8,328	33,083
Hill	—	—	—	852	852
Jefferson	3,012	316	—	5,963	9,291
Judith Basin	35	—	—	21	56
Lake	5,032	9,099	12,818	38,119	65,068
Lewis and Clark	9,205	793	619	8,215	18,832
Lincoln	199,502	7,508	78,677	45,485	331,172
Madison	5,004	2,584	10,768	863	19,219
Meagher	5,469	1,507	—	9,315	16,291
Mineral	31,892	695	2,578	11,293	46,458
Missoula	16,283	10,653	100,278	34,784	161,998
Musselshell	—	347	—	3,814	4,161
Park	2,730	—	3,024	11,025	16,779
Powder River	5,665	32	—	5,556	11,253
Powell	26,014	1,866	25,634	11,112	64,626
Ravalli	30,038	326	926	14,397	45,687
Rosebud	—	150	—	8,240	8,390
Sanders	40,838	4,261	33,683	22,091	100,873
Silver Bow	159	—	—	2,842	3,001
Stillwater	—	—	—	90	90
Sweet Grass	7,717	—	—	412	8,129
Treasure	—	128	—	1,415	1,543
Wheatland	—	—	—	926	926
Total	516,280	55,509	447,581	318,322	1,337,692

<sup>1</sup>Less than 500 board feet.

**Table 31**—Annual timber removals from sawtimber (Scribner rule) on timberland by county and owner group, Montana, 1988

County	Owner group				Total
	National Forest	Other public	Forest industry	Nonindustrial private	
----- Thousand board feet, Scribner rule -----					
Beaverhead	9,373	2,342	—	3,113	14,828
Big Horn	249	—	—	10,172	10,421
Broadwater	1,173	—	—	1,166	2,339
Carbon	153	—	—	104	257
Carter	986	—	—	1,421	2,407
Cascade	( <sup>1</sup> )	( <sup>1</sup> )	—	4,323	4,323
Chouteau	—	—	—	6,438	6,438
Custer	—	—	—	365	365
Dawson	—	—	—	—	—
Deer Lodge	6	966	—	5,222	6,194
Fergus	1,220	399	—	8,528	10,147
Flathead	79,914	8,433	126,105	17,152	231,604
Gallatin	4,432	—	16,993	4,311	25,736
Granite	11,237	846	9,003	7,093	28,179
Hill	—	—	—	726	726
Jefferson	2,566	269	—	5,079	7,914
Judith Basin	30	—	—	18	48
Lake	4,286	7,750	10,918	32,468	55,422
Lewis and Clark	7,840	675	528	6,996	16,039
Lincoln	169,903	6,395	67,014	38,735	282,047
Madison	4,262	2,201	9,171	736	16,370
Meagher	4,658	1,284	—	7,934	13,876
Mineral	27,164	592	2,196	9,619	39,571
Missoula	13,869	9,074	85,414	29,628	137,985
Musselshell	—	296	—	3,248	3,544
Park	2,325	—	2,576	9,390	14,291
Powder River	4,824	27	—	4,729	9,580
Powell	22,158	1,589	21,835	9,465	55,047
Ravalli	25,585	278	789	12,258	38,910
Rosebud	—	128	—	7,013	7,141
Sanders	34,785	3,629	28,690	18,816	85,920
Silver Bow	135	—	—	2,421	2,556
Stillwater	—	—	—	77	77
Sweet Grass	6,573	—	—	351	6,924
Treasure	—	109	—	1,205	1,314
Wheatland	—	—	—	789	789
Total	439,706	47,282	381,232	271,109	1,139,329

<sup>1</sup>Less than 500 board feet.



# TABLES FOR LANDS OUTSIDE THE NATIONAL FORESTS

## Standard Error

**Table 32**—Area of forest land outside National Forests with percent standard error, Montana, 1989

Item	Acres	Percent standard error
Timberland	7,625,281	±1.4
Woodland	71,351	±27.4
Reserved forest land <sup>1</sup>		
Timberland	961,254	
Woodland	19,209	
Total forest land	8,677,095	

<sup>1</sup>Reserved land areas are estimated from aerial photos without field verification; therefore, standard errors are not calculated.

**Table 33**—Net volume, net annual growth, and annual mortality of growing stock and sawtimber on timberland outside National Forests with percent standard error, Montana

Item	All species	
	Volume	Percent standard error
Net volume, 1989		
Growing stock (M cubic feet)	9,579,007	±2.7
Sawtimber <sup>1</sup> (M board feet)	34,598,764	±3.2
Sawtimber <sup>2</sup> (M board feet)	28,652,560	±3.3
Net annual growth, 1988		
Growing stock (M cubic feet)	225,730	±4.4
Sawtimber <sup>1</sup> (M board feet)	954,202	±4.5
Sawtimber <sup>2</sup> (M board feet)	807,782	±4.5
Annual mortality, 1988		
Growing stock (M cubic feet)	73,900	±8.3
Sawtimber <sup>1</sup> (M board feet)	218,138	±9.9
Sawtimber <sup>2</sup> (M board feet)	181,735	±10.0

<sup>1</sup>International ¼-inch rule.

<sup>2</sup>Scribner rule.

## Area

**Table 34**—Total land area outside National Forests by major land class and owner group in Montana, 1989

Land class	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
----- Acres -----						
Timberland						
Reserved	4,594	781,957	786,551	—	174,702	961,253
Nonreserved	763,409	825,740	1,589,149	1,603,362	4,432,770	7,625,281
Total	768,003	1,607,697	2,375,700	1,603,362	4,607,472	8,586,534
Woodland						
Reserved	497	5,946	6,443	—	12,766	19,209
Nonreserved	5,297	19,421	24,718	32	46,601	71,351
Total	5,794	25,367	31,161	32	59,367	90,560
Total forest land						
Reserved	5,091	787,903	792,994	—	187,468	980,462
Nonreserved	768,706	845,161	1,613,867	1,603,394	4,479,371	7,696,632
Total	773,797	1,633,064	2,406,861	1,603,394	4,666,839	8,677,094
Nonforest land	4,659,576	8,824,052	13,483,628	126,491	54,345,722	67,955,841
Total land area	5,433,373	10,457,116	15,890,489	1,729,885	59,012,561	76,632,935

**Table 35**—Area of timberland outside National Forests by forest type and stocking condition class, Montana, 1989

Forest type	Stocking condition						All classes
	Overstocked	Fully stocked	Medium to fully stocked	Poorly stocked	Mature	Nonstocked	
				Acres			
Douglas-fir	71,088	311,467	971,314	828,682	761,784	86,490	3,030,825
Western hemlock	—	—	12,521	—	—	—	12,521
Ponderosa pine	—	164,040	688,358	895,587	391,217	240,821	2,380,023
Western white pine	—	—	—	—	—	—	—
Lodgepole pine	171,059	204,342	222,913	51,020	127,695	15,396	792,425
Western larch	15,925	50,606	78,653	45,900	51,313	7,731	250,128
Western redcedar	—	12,520	6,409	7,731	4,702	—	31,362
Limber pine	—	6,237	15,067	30,848	10,662	4,410	67,224
Grand fir	4,167	35,569	29,093	13,193	13,678	12,676	108,376
Spruce-fir	16,260	25,444	131,465	65,653	128,067	—	366,889
Engelmann spruce	13,817	9,454	43,720	18,645	32,862	4,160	122,658
Aspen	11,957	63,499	83,839	34,463	11,047	6,241	211,046
Cottonwood <sup>1</sup>	10,161	34,485	51,221	117,893	24,230	13,814	251,804
All types	314,434	917,663	2,334,573	2,109,615	1,557,257	391,739	7,625,281

<sup>1</sup>Includes paper birch.

# Number of Trees

**Table 36**—Number of growing-stock trees on timberland outside National Forests by species and diameter class, Montana, 1989

Species	Diameter class (inches at breast height)																All classes
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+		
Thousand trees																	
Douglas-fir	299,473	201,499	133,388	91,367	61,260	39,044	20,506	12,254	7,357	4,012	2,178	1,111	621	390	611	875,071	
Ponderosa pine	155,989	100,665	64,119	48,602	33,625	24,303	15,900	8,164	4,323	2,300	1,105	679	417	253	347	460,791	
Western white pine	—	—	145	—	142	170	41	70	23	11	11	4	5	2	2	626	
Lodgepole pine	186,616	169,098	110,503	62,955	26,652	10,488	3,259	1,461	522	218	85	25	20	5	3	571,910	
Whitebark pine	6,858	3,034	3,231	2,933	1,912	775	262	284	107	96	52	7	11	—	—	19,562	
Limber pine	11,120	10,679	8,138	2,485	1,672	694	378	117	71	54	20	18	—	—	—	35,446	
Western larch	27,010	22,698	19,935	10,308	6,699	3,755	2,203	1,309	925	727	461	315	220	136	139	96,840	
Grand fir	19,729	13,801	6,961	4,873	1,776	1,490	710	423	155	114	83	37	2	—	—	50,154	
Subalpine fir	116,925	40,584	26,631	13,357	6,018	3,010	1,226	383	161	106	—	8	7	2	—	208,418	
Engelmann spruce	41,463	23,895	11,049	9,386	4,578	3,533	2,356	1,661	986	439	269	110	81	82	66	99,954	
Western hemlock	2,962	1,222	303	484	194	196	31	21	31	10	10	8	—	—	—	5,472	
Western redcedar	34,079	7,447	2,690	938	809	449	240	52	145	30	43	33	41	28	28	47,052	
Total softwoods	902,224	594,622	387,093	247,688	145,337	87,907	47,112	26,199	14,806	8,117	4,317	2,355	1,425	898	1,196	2,471,296	
Aspen	50,670	34,986	15,797	11,894	5,503	1,971	551	125	14	11	—	—	—	—	—	121,522	
Cottonwood <sup>1</sup>	25,010	8,335	7,146	3,407	2,724	1,916	1,308	621	763	528	318	268	113	73	141	52,671	
Total hardwoods	75,680	43,321	22,943	15,301	8,227	3,887	1,859	746	777	539	318	268	113	73	141	174,193	
All species	977,904	637,943	410,036	262,989	153,564	91,794	48,971	26,945	15,583	8,656	4,635	2,623	1,538	971	1,337	2,645,489	

<sup>1</sup>Includes paper birch.



**Table 37**—Number of cull and salvable dead trees on timberland outside National Forests by owner group and species group, Montana, 1989

Owner group	Species group	Cull trees			Salvable dead trees	Total
		Rough	Rotten	Total		
----- Thousand trees -----						
Other public State	Softwoods	1,822	969	2,791	9,323	12,114
	Hardwoods	25	155	180	41	221
	Total	1,847	1,124	2,971	9,364	12,335
Other	Softwoods	2,670	579	3,249	6,520	9,769
	Hardwoods	35	75	110	62	172
	Total	2,705	654	3,359	6,582	9,941
Total other public	Softwoods	4,492	1,548	6,040	15,843	21,883
	Hardwoods	60	230	290	103	393
	Total	4,552	1,778	6,330	15,946	22,276
Forest industry	Softwoods	4,345	2,257	6,602	24,180	30,782
	Hardwoods	(1)	2	2	6	8
	Total	4,345	2,259	6,604	24,186	30,790
Nonindustrial private	Softwoods	14,272	2,364	16,636	36,465	53,101
	Hardwoods	1,111	3,996	5,107	1,672	6,779
	Total	15,383	6,360	21,743	38,137	59,880
Total	Softwoods	23,109	6,169	29,278	76,488	105,766
	Hardwoods	1,171	4,228	5,399	1,781	7,180
	Total	24,280	10,397	34,677	78,269	112,946

<sup>1</sup>Less than 500 trees.

## Volume

**Table 38**—Net volume of growing stock on timberland outside National Forests by forest type and stand-size class, Montana, 1989

Forest type	Stand-size class				All classes
	Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand cubic feet -----					
Douglas-fir	3,356,605	552,226	124,281	5,007	4,038,119
Western hemlock	8,505	—	—	—	8,505
Ponderosa pine	1,505,680	148,279	115,448	18,252	1,787,659
Western white pine	—	—	—	—	—
Lodgepole pine	554,149	949,331	49,614	2,420	1,555,514
Western larch	270,800	82,089	29,291	402	382,582
Western redcedar	72,314	14,532	—	—	86,846
Limber pine	15,311	6,819	1,609	—	23,739
Grand fir	217,402	—	12,347	—	229,749
Spruce-fir	607,406	108,873	10,309	—	726,588
Engelmann spruce	245,467	18,194	324	—	263,985
Aspen	59,910	151,502	10,537	—	221,949
Cottonwood <sup>1</sup>	158,429	83,084	11,133	1,126	253,772
All types	7,071,978	2,114,929	364,893	27,207	9,579,007

<sup>1</sup>Includes paper birch.

**Table 39**—Net volume of sawtimber (International ¼-inch rule) on timberland outside National Forests by forest type and stand-size class, Montana, 1989

Forest type	Stand-size class				All classes
	Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand board feet, International ¼-inch rule -----					
Douglas-fir	14,263,504	1,033,753	473,310	15,365	15,785,932
Western hemlock	43,742	—	—	—	43,742
Ponderosa pine	6,544,107	285,254	446,628	70,664	7,346,653
Western white pine	—	—	—	—	—
Lodgepole pine	2,091,687	1,357,762	78,644	12,765	3,540,858
Western larch	1,246,150	135,565	121,083	—	1,502,798
Western redcedar	326,255	19,616	—	—	345,871
Limber pine	81,729	9,314	6,407	—	97,450
Grand fir	847,410	—	36,234	—	883,644
Spruce-fir	2,515,045	219,425	19,694	—	2,754,164
Engelmann spruce	1,016,903	44,496	—	—	1,061,399
Aspen	209,471	192,378	14,356	—	416,205
Cottonwood¹	650,244	157,507	6,998	5,299	820,048
All types	29,836,247	3,455,070	1,203,354	104,093	34,598,764

<sup>1</sup>Includes paper birch.

**Table 40**—Net volume of sawtimber (Scribner rule) on timberland outside National Forests by forest type and stand-size class, Montana, 1989

Forest type	Stand-size class				All classes
	Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand board feet, Scribner rule -----					
Douglas-fir	11,788,182	809,827	381,119	11,909	12,991,037
Western hemlock	34,151	—	—	—	34,151
Ponderosa pine	5,394,549	219,013	367,909	58,450	6,039,921
Western white pine	—	—	—	—	—
Lodgepole pine	1,759,289	1,132,852	65,254	10,666	2,968,061
Western larch	1,040,955	106,507	102,473	—	1,249,935
Western redcedar	270,072	15,251	—	—	285,323
Limber pine	65,295	6,721	4,375	—	76,391
Grand fir	718,067	—	28,709	—	746,776
Spruce-fir	2,133,108	177,857	14,752	—	2,325,717
Engelmann spruce	855,297	37,787	—	—	893,084
Aspen	176,730	156,224	11,359	—	344,313
Cottonwood <sup>1</sup>	558,296	129,273	6,080	4,202	697,851
All types	24,793,991	2,791,312	982,030	85,227	28,652,560

<sup>1</sup>Includes paper birch.

**Table 41**—Net volume of growing stock on timberland outside National Forests by species and owner group, Montana, 1989

Species	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
----- Thousand cubic feet -----						
Douglas-fir	526,727	345,280	872,007	874,822	1,783,654	3,530,483
Ponderosa pine	192,334	182,801	375,135	136,638	1,485,937	1,997,710
Western white pine	5,542	28	5,570	8,237	1,959	15,766
Lodgepole pine	173,178	343,729	516,907	413,820	754,153	1,684,880
Whitebark pine	12,642	21,985	34,627	18,693	19,061	72,381
Limber pine	3,065	8,934	11,999	2,221	38,395	52,615
Western larch	151,448	3,337	154,785	301,778	189,278	645,841
Grand fir	39,730	183	39,913	71,606	58,228	169,747
Subalpine fir	88,130	61,244	149,374	118,218	99,459	367,051
Engelmann spruce	78,570	45,885	124,455	174,819	215,808	515,082
Western hemlock	709	83	792	10,132	4,014	14,938
Western redcedar	12,024	410	12,434	20,583	19,772	52,789
Total softwoods	1,284,099	1,013,899	2,297,998	2,151,567	4,669,718	9,119,283
Aspen	2,991	9,541	12,532	879	198,141	211,552
Cottonwood <sup>1</sup>	18,612	6,757	25,369	9,790	213,013	248,172
Total hardwoods	21,603	16,298	37,901	10,669	411,154	459,724
All species	1,305,702	1,030,197	2,335,899	2,162,236	5,080,872	9,579,007

<sup>1</sup>Includes paper birch.



**Table 42**—Net volume of sawtimber (International ¼-inch rule) on timberland outside National Forests by species and owner group, Montana, 1989

Species	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
----- Thousand board feet, International ¼-inch rule -----						
Douglas-fir	2,147,718	1,380,667	3,528,385	3,477,655	6,774,019	13,780,059
Ponderosa pine	893,503	643,836	1,537,339	700,185	6,425,617	8,663,141
Western white pine	32,493	129	32,622	47,724	9,639	89,985
Lodgepole pine	495,169	944,494	1,439,663	651,999	1,834,050	3,925,712
Whitebark pine	46,458	83,335	129,793	77,028	66,977	273,798
Limber pine	14,289	22,110	36,399	12,643	120,902	169,944
Western larch	786,137	16,249	802,386	1,332,173	720,978	2,855,537
Grand fir	145,078	684	145,762	233,669	203,054	582,485
Subalpine fir	236,037	164,267	400,304	239,926	180,929	821,159
Engelmann spruce	339,758	168,999	508,757	756,735	888,722	2,154,214
Western hemlock	2,930	315	3,245	38,160	14,617	56,022
Western redcedar	51,841	1,034	52,875	75,403	51,354	179,632
Total softwoods	5,191,411	3,426,119	8,617,530	7,643,300	17,290,858	33,551,688
Aspen	2,681	1,566	4,247	3,307	252,471	260,025
Cottonwood <sup>1</sup>	50,379	25,658	76,037	16,611	694,403	787,051
Total hardwoods	53,060	27,224	80,284	19,918	946,874	1,047,076
All species	5,244,471	3,453,343	8,697,814	7,663,218	18,237,732	34,598,764

<sup>1</sup>Includes paper birch.

**Table 43**—Net volume of sawtimber (Scribner rule) on timberland outside National Forests by species and owner group, Montana, 1989

Species	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
----- Thousand board feet, Scribner rule -----						
Douglas-fir	1,796,253	1,129,255	2,925,508	2,908,918	5,510,422	11,344,848
Ponderosa pine	733,694	524,265	1,257,959	577,996	5,305,760	7,141,715
Western white pine	28,166	107	28,273	40,401	7,770	76,444
Lodgepole pine	417,761	794,076	1,211,837	552,400	1,543,991	3,308,228
Whitebark pine	37,775	70,457	108,232	63,860	52,946	225,038
Limber pine	11,439	17,920	29,359	10,096	94,549	134,004
Western larch	658,851	14,036	672,887	1,096,086	571,893	2,340,866
Grand fir	122,418	570	122,988	198,595	168,905	490,488
Subalpine fir	194,535	135,205	329,740	199,475	147,413	676,628
Engelmann spruce	291,800	143,493	435,293	647,322	751,660	1,834,275
Western hemlock	2,365	252	2,617	32,933	11,687	47,237
Western redcedar	41,395	793	42,188	60,369	39,725	142,282
Total softwoods	4,336,452	2,830,429	7,166,881	6,388,451	14,206,721	27,762,053
Aspen	2,198	1,275	3,473	2,903	209,579	215,955
Cottonwood¹	40,676	21,761	62,437	14,570	597,545	674,552
Total hardwoods	42,874	23,036	65,910	17,473	807,124	890,507
All species	4,379,326	2,853,465	7,232,791	6,405,924	15,013,845	28,652,560

<sup>1</sup>Includes paper birch.

**Table 44—Net volume of growing stock on timberland outside National Forests by species and diameter class, Montana, 1989**

Species	Diameter class (inches at breast height)														Thousand cubic feet				All classes			
	5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+									
Douglas-fir	299,071	468,471	567,953	572,948	432,848	361,578	278,231	191,198	123,845	75,460	49,299	36,584	72,999	3,530,485								
Ponderosa pine	86,788	205,685	280,511	336,868	322,626	241,786	165,957	114,137	68,215	50,294	41,605	25,863	57,377	1,997,712								
Western white pine	189	—	2,138	3,857	1,277	3,186	1,396	792	943	588	570	460	369	15,765								
Lodgepole pine	376,924	504,984	375,565	226,597	94,426	58,157	24,286	13,030	5,958	2,026	1,877	542	508	1,684,880								
Whitebark pine	7,172	14,499	16,388	11,004	4,594	7,628	3,793	3,683	2,606	374	641	—	—	72,382								
Limber pine	13,440	8,793	10,171	6,404	6,163	2,182	2,134	1,861	617	850	—	—	—	52,615								
Western larch	54,252	71,155	85,749	76,948	65,330	55,375	51,177	47,497	38,444	31,844	24,387	17,815	25,868	645,841								
Grand fir	19,789	33,822	23,048	29,338	21,265	15,853	8,144	7,743	7,020	3,434	291	—	—	169,747								
Subalpine fir	102,635	91,017	67,625	51,397	28,444	12,929	6,576	5,373	—	483	446	124	—	367,049								
Engelmann spruce	36,758	67,523	60,325	70,220	68,413	66,886	49,683	28,822	21,665	11,555	9,328	11,968	11,935	515,081								
Western hemlock	926	2,632	2,270	3,732	734	888	1,255	807	953	741	—	—	—	14,938								
Western redcedar	9,155	5,684	8,617	6,752	4,632	1,452	3,832	1,166	1,653	1,904	2,617	1,959	3,365	52,788								
Total softwoods	1,007,099	1,474,265	1,500,360	1,396,065	1,050,752	827,900	596,464	416,109	271,919	179,553	131,061	95,315	172,421	9,119,283								
Aspen	38,173	68,060	55,032	32,195	12,843	4,267	428	555	—	—	—	—	—	211,553								
Cottonwood <sup>1</sup>	27,319	26,471	29,195	27,600	23,438	16,028	23,486	18,054	12,872	15,053	7,314	5,066	16,275	248,171								
Total hardwoods	65,492	94,531	84,227	59,795	36,281	20,295	23,914	18,609	12,872	15,053	7,314	5,066	16,275	459,724								
All species	1,072,591	1,568,796	1,584,587	1,455,860	1,087,033	848,195	620,378	434,718	284,791	194,606	138,375	100,381	188,696	9,579,007								

<sup>1</sup>Includes paper birch.

**Table 45—Net volume of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and diameter class, Montana, 1989**

Species	Diameter class (inches at breast height)										International 1/4-inch rule				All classes
	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+				
----- Thousand board feet, International 1/4-inch rule -----															
Douglas-fir	2,001,094	2,689,740	2,226,517	1,959,543	1,570,153	1,112,103	739,569	459,611	306,741	229,850	485,139	13,780,060			
Ponderosa pine	889,847	1,386,530	1,602,856	1,369,405	998,005	726,599	449,607	341,606	290,587	186,601	421,498	8,663,141			
Western white pine	11,150	21,691	7,346	18,650	8,259	4,748	5,722	3,556	3,625	2,809	2,429	89,985			
Lodgepole pine	1,525,556	1,294,365	532,400	318,069	129,935	67,762	31,099	10,684	10,027	2,965	2,851	3,925,713			
Whitebark pine	72,558	66,970	27,956	44,140	21,404	20,660	14,294	2,108	3,709	—	—	273,799			
Limber pine	45,703	41,620	37,788	13,274	12,229	10,667	3,742	4,921	—	—	—	169,944			
Western larch	341,893	433,804	373,160	317,161	296,176	281,787	228,149	188,231	144,957	103,940	146,278	2,855,536			
Grand fir	91,299	150,593	115,498	87,460	43,666	39,917	35,403	17,288	1,360	—	—	582,484			
Subalpine fir	266,356	268,774	149,761	67,978	34,308	28,141	—	2,626	2,505	709	—	821,158			
Engelmann spruce	252,836	383,500	371,421	358,270	262,490	151,499	114,936	63,789	52,759	70,444	72,269	2,154,213			
Western hemlock	8,853	18,222	3,698	4,708	6,602	4,388	5,338	4,213	—	—	—	56,022			
Western redcedar	38,174	33,789	23,166	7,205	18,504	5,545	7,717	8,840	12,068	9,020	15,605	179,633			
Total softwoods	5,545,319	6,789,598	5,471,567	4,565,863	3,401,731	2,453,816	1,635,576	1,107,473	828,338	606,338	1,146,069	33,551,688			
Aspen	XXXXX <sup>1</sup>	166,901	66,460	21,830	2,124	2,709	—	—	—	—	—	260,024			
Cottonwood <sup>2</sup>	XXXXX	137,855	117,740	79,263	111,465	83,932	58,432	67,681	32,795	22,744	75,145	787,052			
Total hardwoods	XXXXX	304,756	184,200	101,093	113,589	86,641	58,432	67,681	32,795	22,744	75,145	1,047,076			
All species	5,545,319	7,094,354	5,655,767	4,666,956	3,515,320	2,540,457	1,694,008	1,175,154	861,133	629,082	1,221,214	34,598,764			

<sup>1</sup>Hardwoods are not considered sawtimber until they are 11 inches d.b.h.

<sup>2</sup>Includes paper birch.



**Table 46—Net volume of sawtimber (Scribner rule) on timberland outside National Forests by species and diameter class, Montana, 1989**

Species	Diameter class (inches at breast height)											All classes
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	
----- Thousand board feet, Scribner rule -----												
Douglas-fir	1,486,165	2,077,971	1,825,899	1,658,928	1,351,435	967,840	658,216	409,054	273,000	204,566	431,774	11,344,848
Ponderosa pine	625,690	1,127,624	1,320,633	1,131,830	834,631	621,294	388,156	296,321	255,592	164,878	375,066	7,141,715
Western white pine	8,586	17,756	6,231	16,259	7,301	4,222	5,041	3,165	3,222	2,500	2,162	76,445
Lodgepole pine	1,280,898	1,070,159	452,964	277,722	114,917	60,280	27,678	9,509	8,924	2,639	2,537	3,308,227
Whitebark pine	57,222	52,836	22,836	37,558	18,596	18,110	12,703	1,876	3,301	—	—	225,038
Limber pine	34,423	30,509	30,610	10,970	10,564	9,302	3,246	4,380	—	—	—	134,004
Western larch	254,652	312,005	293,536	263,233	253,114	244,604	201,025	167,128	128,874	92,507	130,187	2,340,865
Grand fir	72,375	122,040	98,315	75,793	38,449	35,413	31,506	15,387	1,211	—	—	490,489
Subalpine fir	216,009	216,710	125,388	58,630	29,923	24,778	—	2,329	2,229	631	—	676,627
Engelmann spruce	207,792	312,405	312,924	307,773	227,749	132,598	102,293	56,772	46,956	62,695	64,320	1,834,277
Western hemlock	6,801	14,899	3,091	4,171	5,876	3,905	4,744	3,749	—	—	—	47,236
Western redcedar	29,165	25,834	17,896	5,618	14,429	4,376	6,157	7,359	10,155	7,651	13,643	142,283
Total softwoods	4,279,778	5,380,748	4,510,323	3,848,485	2,906,984	2,126,722	1,440,765	977,029	733,464	538,067	1,019,689	27,762,054
Aspen	XXXXX <sup>1</sup>	136,016	56,532	19,142	1,854	2,411	—	—	—	—	—	215,955
Cottonwood <sup>2</sup>	XXXXX	110,009	98,193	68,306	96,447	73,556	51,574	60,183	29,186	20,235	66,862	674,551
Total hardwoods	XXXXX	246,025	154,725	87,448	98,301	75,967	51,574	60,183	29,186	20,235	66,862	890,506
All species	4,279,778	5,626,773	4,665,048	3,935,933	3,005,285	2,202,689	1,492,339	1,037,212	762,650	558,302	1,086,551	28,652,560

<sup>1</sup>Hardwoods are not considered sawtimber until they are 11 inches d.b.h.

<sup>2</sup>Includes paper birch.

**Table 47—Net volume of timber on timberland outside National Forests by class of timber and species group, Montana, 1989**

Class of timber	Species group		Total
	Softwoods	Hardwoods	
	----- Thousand cubic feet -----		
Sawtimber trees			
Sawlog portion	5,814,076	166,989	5,981,065
Upper-stem portion	823,842	48,485	872,327
Total	6,637,918	215,474	6,853,392
Poletimber trees	2,481,365	244,250	2,725,615
All growing-stock trees	9,119,283	459,724	9,579,007
Rough cull trees	146,218	6,500	152,718
Rotten cull trees	33,679	8,537	42,216
Salvable dead trees	411,695	7,213	418,908
All timber	9,710,875	481,974	10,192,849

Table 48—Net volume of growing stock on timberland outside National Forests by forest type and species, Montana, 1989

Forest type	Species															
	Douglas- fir	Ponderosa pine	Western white pine	Lodgepole pine	White- bark pine	Limber pine	Western larch	Grand fir	Sub- alpine fir	Engel- mann spruce	Western hemlock	Western redcedar	Total soft- woods	Cotton- wood <sup>1</sup>	Total hard- woods	All species
----- Thousand cubic feet -----																
Douglas-fir	3,055,961	302,574	732	258,474	625	18,811	222,568	33,112	36,213	91,202	161	140	4,020,573	9,398	8,148	4,038,119
Western hemlock	—	2,140	—	—	—	—	2,130	788	—	—	2,138	1,310	8,506	—	—	8,506
Ponderosa pine	108,842	1,652,997	—	6,253	—	6,763	4,988	321	—	1,910	—	—	1,782,074	2,365	3,220	1,787,659
Western white pine	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lodgepole pine	113,585	18,698	1,695	1,250,678	13,784	1,098	56,743	8,068	47,293	22,328	303	2,215	1,536,488	10,932	8,095	1,555,515
Western larch	54,592	5,096	2,621	34,862	—	—	235,694	13,417	6,861	12,564	3,867	10,118	379,692	1,432	1,456	382,580
Western redcedar	11,240	—	2,160	—	—	—	17,210	7,437	1,582	8,866	3,536	33,557	85,588	711	548	86,847
Limber pine	5,598	—	—	1,671	—	16,078	—	—	—	—	—	—	23,347	392	—	23,739
Grand fir	49,263	1,625	3,220	14,729	—	—	20,050	101,773	4,174	25,115	4,360	3,605	227,914	—	1,833	229,747
Spruce-fir	69,035	—	4,342	77,257	57,973	566	65,888	2,392	260,274	185,118	573	803	724,221	—	2,368	726,589
Engelmann spruce	40,068	295	—	20,141	—	8,287	15,586	181	8,848	160,214	—	935	254,555	627	8,803	263,985
Aspen	18,959	10,032	—	9,894	—	1,012	—	—	1,522	3,782	—	—	45,201	176,426	322	176,748
Cottonwood <sup>1</sup>	3,340	4,252	995	10,921	—	—	4,983	2,259	285	3,983	—	106	31,124	9,269	213,379	222,648
All types	3,530,483	1,997,709	15,765	1,684,880	72,382	52,615	645,840	169,748	367,052	515,082	14,938	52,789	9,119,283	211,552	248,172	9,579,007

<sup>1</sup>Includes paper birch.

Table 49—Net volume of sawtimber (International 1/4-inch rule) on timberland outside National Forests by forest type and species, Montana, 1989

Forest type	Species															
	Douglas- fir	Ponderosa pine	Western white pine	Lodgepole pine	White- bark pine	Limber pine	Western larch	Grand fir	Sub- alpine fir	Engel- mann spruce	Western hemlock	Western redcedar	Total soft- woods	Cotton- wood <sup>1</sup>	Total hard- woods	All species
Thousand board feet, International 1/4-inch rule																
Douglas-fir	11,888,137	1,554,947	3,731	763,055	978	58,640	938,575	111,810	86,679	346,390	770	687	15,754,399	9,035	22,500	15,785,934
Western hemlock	—	13,567	—	—	—	—	11,915	4,293	—	—	7,699	6,268	43,742	—	—	43,742
Ponderosa pine	389,163	6,861,363	—	22,408	—	26,337	20,487	1,583	—	8,398	—	—	7,329,739	1,279	15,634	7,346,652
Western white pine	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lodgepole pine	362,094	107,471	9,386	2,561,039	30,755	1,120	236,170	20,837	78,748	80,249	—	5,564	3,493,433	22,897	24,526	3,540,856
Western larch	216,499	26,955	15,191	49,848	—	—	1,053,474	32,770	15,448	43,861	14,809	28,713	1,497,568	5,229	—	1,502,797
Western redcedar	55,644	—	11,778	—	—	—	58,173	38,164	2,906	45,144	7,898	120,335	340,042	3,743	2,084	345,869
Limber pine	23,726	—	—	9,726	—	63,999	—	—	—	—	—	—	97,451	—	—	97,451
Grand fir	229,761	12,002	18,925	49,500	—	—	110,583	348,938	3,316	73,345	21,917	12,159	880,446	—	3,198	883,644
Spruce-fir	357,891	—	25,291	304,968	242,066	—	331,957	12,726	614,261	848,773	2,929	2,051	2,742,913	—	11,252	2,754,165
Engelmann spruce	169,784	1,861	—	75,370	—	18,294	72,650	955	19,285	678,284	—	3,854	1,040,337	—	21,064	1,061,401
Aspen	79,921	61,294	—	38,999	—	1,554	—	—	—	18,941	—	—	200,709	—	215,496	416,205
Cottonwood <sup>1</sup>	7,440	23,681	5,682	50,799	—	—	21,553	10,410	515	10,829	—	—	130,909	2,345	686,794	820,048
All types	13,780,060	8,663,141	89,984	3,925,712	273,799	169,944	2,855,537	582,486	821,158	2,154,214	56,022	179,631	33,551,688	260,024	787,052	34,598,764

<sup>1</sup>Includes paper birch.





## Growth

**Table 51**—Net annual growth of growing stock on timberland outside National Forests by species and owner group, Montana, 1988

Species	Owner group					Total
	Other public		Total other public	Forest industry	Nonindustrial private	
	State	Other				
----- Thousand cubic feet -----						
Douglas-fir	13,003	7,421	20,424	25,919	50,887	97,230
Ponderosa pine	4,615	5,164	9,779	2,976	35,735	48,490
Western white pine	-187	2	-185	41	95	-49
Lodgepole pine	1,299	4,731	6,030	-97	13,880	19,813
Whitebark pine	-586	382	-204	-115	-40	-359
Limber pine	46	-72	-26	-1,322	738	-610
Western larch	2,281	68	2,349	8,580	5,309	16,238
Grand fir	1,448	11	1,459	2,928	2,367	6,754
Subalpine fir	2,239	2,141	4,380	6,347	3,748	14,475
Engelmann spruce	2,022	1,079	3,101	2,761	3,167	9,029
Western hemlock	19	6	25	364	302	691
Western redcedar	268	24	292	866	1,128	2,286
Total softwoods	26,467	20,957	47,424	49,248	117,316	213,988
Aspen	271	939	1,210	-22	4,026	5,214
Cottonwood¹	500	151	651	122	5,755	6,528
Total hardwoods	771	1,090	1,861	100	9,781	11,742
All species	27,238	22,047	49,285	49,348	127,097	225,730

<sup>1</sup>Includes paper birch.

**Table 52**—Net annual growth of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and owner group, Montana, 1988

Species	Owner group					Total
	Other public		Total other public	Forest industry	Nonindustrial private	
	State	Other				
----- Thousand board feet, International 1/4-inch rule -----						
Douglas-fir	60,488	33,265	93,753	112,557	230,432	436,742
Ponderosa pine	28,658	19,220	47,878	17,324	210,517	275,719
Western white pine	-1,011	4	-1,007	685	314	-8
Lodgepole pine	-2,904	15,808	12,904	11,869	32,976	57,749
Whitebark pine	-2,376	1,002	-1,374	1,520	-1,769	-1,623
Limber pine	238	378	616	-6,455	2,068	-3,771
Western larch	8,428	262	8,690	33,250	21,488	63,428
Grand fir	6,271	40	6,311	7,403	7,276	20,990
Subalpine fir	6,687	6,902	13,589	9,560	4,882	28,031
Engelmann spruce	5,157	2,184	7,341	9,051	11,332	27,724
Western hemlock	145	50	195	1,042	2,317	3,554
Western redcedar	647	91	738	2,773	4,269	7,780
Total softwoods	110,428	79,206	189,634	200,579	526,102	916,315
Aspen	22	-52	-30	72	12,603	12,645
Cottonwood <sup>1</sup>	3,002	962	3,964	-323	21,601	25,242
Total hardwoods	3,024	910	3,934	-251	34,204	37,887
All species	113,452	80,116	193,568	200,328	560,306	954,202

<sup>1</sup>Includes paper birch.

**Table 53**—Net annual growth of sawtimber (Scribner rule) on timberland outside National Forests by species and owner group, Montana, 1988

Species	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
----- Thousand board feet, Scribner rule -----						
Douglas-fir	51,578	26,650	78,228	94,342	193,841	366,411
Ponderosa pine	23,060	14,762	37,822	13,714	168,983	220,519
Western white pine	-868	4	-864	714	288	138
Lodgepole pine	-1,830	15,193	13,363	12,137	31,321	56,821
Whitebark pine	-1,963	915	-1,048	1,363	-1,303	-988
Limber pine	190	340	530	-5,284	1,839	-2,915
Western larch	7,917	236	8,153	29,394	18,810	56,357
Grand fir	5,605	35	5,640	6,584	6,662	18,886
Subalpine fir	6,151	6,146	12,297	8,786	4,498	25,581
Engelmann spruce	4,709	1,970	6,679	8,527	10,453	25,659
Western hemlock	133	37	170	952	1,716	2,838
Western redcedar	546	80	626	2,405	3,723	6,754
Total softwoods	95,228	66,368	161,596	173,634	440,831	776,061
Aspen	25	-38	-13	61	10,551	10,599
Cottonwood <sup>1</sup>	2,176	803	2,979	-277	18,420	21,122
Total hardwoods	2,201	765	2,966	-216	28,971	31,721
All species	97,429	67,133	164,562	173,418	469,802	807,782

<sup>1</sup>Includes paper birch.

Table 54—Net annual growth of growing stock on timberland outside National Forests by species and diameter class, Montana, 1988

Species	Diameter class (inches at breast height)														All classes			
	5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+					
----- Thousand cubic feet -----																		
Douglas-fir	23,719	16,077	17,116	14,150	9,387	6,557	4,753	2,504	1,405	778	92	334	358	97,230				
Ponderosa pine	7,893	6,895	7,933	7,924	6,676	4,827	2,530	1,717	903	414	277	181	320	48,490				
Western white pine	37	-73	35	35	-45	102	-52	18	-31	-26	9	4	-64	-51				
Lodgepole pine	19,425	3,684	-381	-1,263	-1,097	-147	-421	-8	-37	17	27	7	7	19,813				
Whitebark pine	126	145	128	-257	-219	-66	-13	-11	-99	-66	-26	—	—	-358				
Limber pine	108	-151	94	45	-172	-273	-114	-88	-64	5	—	—	—	-610				
Western larch	5,169	2,370	2,730	1,973	1,222	1,088	335	432	342	187	90	120	181	16,239				
Grand fir	1,933	1,500	800	1,003	571	431	228	90	113	77	7	—	—	6,753				
Subalpine fir	10,590	1,114	1,042	801	707	144	56	17	—	2	1	1	—	14,475				
Engelmann spruce	2,332	2,107	978	1,592	996	464	394	147	-93	113	27	2	-31	9,028				
Western hemlock	59	181	156	174	19	24	48	16	9	6	—	—	—	692				
Western redcedar	1,222	202	285	195	123	14	79	27	26	29	42	9	33	2,286				
Total softwoods	72,613	34,051	30,916	26,372	18,168	13,165	7,823	4,861	2,474	1,536	546	658	804	213,987				
Aspen	3,144	1,231	713	250	-93	75	-115	8	—	—	—	—	—	5,213				
Cottonwood <sup>1</sup>	2,069	1,084	1,311	711	418	148	198	245	102	137	24	75	8	6,530				
Total hardwoods	5,213	2,315	2,024	961	325	223	83	253	102	137	24	75	8	11,743				
All species	77,826	36,366	32,940	27,333	18,493	13,388	7,906	5,114	2,576	1,673	570	733	812	225,730				

<sup>1</sup>Includes paper birch.



Table 55—Net annual growth of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and diameter class, Montana, 1988

Species	Diameter class (inches at breast height)												All classes
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+		
----- Thousand board feet, International 1/4-inch rule -----													
Douglas-fir	189,872	84,693	56,805	40,352	29,683	16,030	9,020	5,038	764	2,147	2,338	436,742	
Ponderosa pine	88,735	54,732	48,312	35,981	18,927	12,795	6,526	3,238	2,412	1,725	2,336	275,719	
Western white pine	248	289	-260	577	-295	108	-179	-155	60	27	-428	-8	
Lodgepole pine	76,961	-8,617	-6,586	-1,372	-2,589	-118	-238	84	146	38	40	57,749	
Whitebark pine	2,830	-1,556	-1,389	-383	-76	-59	-508	-340	-143	—	—	-1,624	
Limber pine	280	190	-1,095	-1,598	-677	-537	-362	28	—	—	—	-3,771	
Western larch	29,221	11,381	7,059	6,368	1,962	2,547	1,997	991	399	587	916	63,428	
Grand fir	6,880	6,199	3,258	2,284	1,104	369	497	370	29	—	—	20,990	
Subalpine fir	18,586	4,506	3,784	742	272	113	—	17	9	3	—	28,032	
Engelmann spruce	8,573	8,646	5,138	2,205	1,877	737	-401	760	249	95	-155	27,724	
Western hemlock	1,835	1,031	110	130	263	90	55	39	—	—	—	3,553	
Western redcedar	4,959	1,034	611	66	353	131	113	130	189	42	153	7,781	
Total softwoods	428,980	162,528	115,747	85,352	50,804	32,206	16,520	10,200	4,114	4,664	5,200	916,315	
Aspen	XXXXX <sup>1</sup>	13,333	-519	359	-564	36	—	—	—	—	—	12,645	
Cottonwood <sup>2</sup>	XXXXX	19,492	1,998	569	677	987	374	610	111	347	77	25,242	
Total hardwoods	XXXXX	32,825	1,479	928	113	1,023	374	610	111	347	77	37,887	
All species	428,980	195,353	117,226	86,280	50,917	33,229	16,894	10,810	4,225	5,011	5,277	954,202	

<sup>1</sup>Hardwoods are not considered sawtimber until they are 11 inches d.b.h.

<sup>2</sup>Includes paper birch.

Table 56—Net annual growth of sawtimber (Scribner rule) on timberland outside National Forests by species and diameter class, Montana, 1988

Species	Diameter class (inches at breast height)												Thousand board feet, Scribner rule								All classes
	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+										
Douglas-fir	142,767	76,751	51,558	36,688	26,922	14,541	8,028	4,484	680	1,911	2,081	366,411									
Ponderosa pine	59,231	45,899	40,816	31,219	17,118	11,722	5,875	2,878	2,147	1,534	2,079	220,518									
Western white pine	242	318	-199	531	-258	99	-155	-138	55	24	-381	138									
Lodgepole pine	70,499	-5,189	-5,174	-1,059	-2,219	-101	-210	75	130	34	35	56,821									
Whitebark pine	2,569	-1,175	-1,071	-319	-60	-51	-450	-303	-127	—	—	-987									
Limber pine	301	295	-839	-1,345	-578	-454	-320	25	—	—	—	-2,915									
Western larch	24,085	10,646	6,826	5,941	1,965	2,421	1,862	914	362	522	815	56,359									
Grand fir	5,895	5,720	2,998	2,119	1,016	339	444	330	26	—	—	18,887									
Subalpine fir	16,707	4,272	3,480	712	266	117	—	15	8	3	—	25,580									
Engelmann spruce	7,775	7,949	4,830	2,137	1,779	701	-357	676	222	85	-138	25,659									
Western hemlock	1,275	936	107	119	234	80	52	34	—	—	—	2,837									
Western redcedar	4,398	848	487	52	280	111	102	120	174	43	139	6,754									
Total softwoods	335,744	147,270	103,819	76,795	46,465	29,525	14,871	9,110	3,677	4,156	4,630	776,062									
Aspen	XXXXX <sup>1</sup>	11,058	-339	335	-487	32	—	—	—	—	—	10,599									
Cottonwood <sup>2</sup>	XXXXX	15,701	1,876	587	668	902	342	559	106	311	69	21,121									
Total hardwoods	XXXXX	26,759	1,537	922	181	934	342	559	106	311	69	31,720									
All species	335,744	174,029	105,356	77,717	46,646	30,459	15,213	9,669	3,783	4,467	4,699	807,782									

<sup>1</sup>Hardwoods are not considered sawtimber until they are 11 inches d.b.h.

<sup>2</sup>Includes paper birch.

## Mortality

**Table 57**—Annual mortality of growing stock on timberland outside National Forests by species and owner group, Montana, 1988

Species	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
----- Thousand cubic feet -----						
Douglas-fir	1,553	495	2,048	2,066	3,761	7,875
Ponderosa pine	818	1,231	2,049	1,812	12,188	16,049
Western white pine	278	—	278	201	—	479
Lodgepole pine	4,749	4,046	8,795	13,971	8,871	31,637
Whitebark pine	783	—	783	266	436	1,485
Limber pine	19	281	300	1,370	275	1,945
Western larch	555	1	556	603	787	1,946
Grand fir	164	1	165	113	178	456
Subalpine fir	1,092	277	1,369	1,663	564	3,596
Engelmann spruce	411	1	412	1,981	1,723	4,116
Western hemlock	13	—	13	—	—	13
Western redcedar	20	—	20	—	—	20
Total softwoods	10,455	6,333	16,788	24,046	28,783	69,617
Aspen	28	24	52	39	2,963	3,054
Cottonwood¹	42	11	53	190	986	1,229
Total hardwoods	70	35	105	229	3,949	4,283
All species	10,525	6,368	16,893	24,275	32,732	73,900

<sup>1</sup>Includes paper birch.

**Table 58**—Annual mortality of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and owner group, Montana, 1988

Species	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
----- Thousand board feet, International 1/4-inch rule -----						
Douglas-fir	6,104	1,341	7,445	6,444	14,288	28,177
Ponderosa pine	2,799	4,779	7,578	8,473	34,985	51,036
Western white pine	1,554	—	1,554	800	—	2,354
Lodgepole pine	12,599	15,164	27,763	29,477	24,011	81,251
Whitebark pine	4,041	—	4,041	106	2,642	6,789
Limber pine	—	—	—	6,689	156	6,845
Western larch	2,538	5	2,543	1,315	2,888	6,746
Grand fir	656	—	656	595	—	1,251
Subalpine fir	2,190	700	2,890	1,955	360	5,205
Engelmann spruce	1,884	4	1,888	8,665	8,071	18,624
Western hemlock	—	—	—	—	—	—
Western redcedar	90	—	90	—	—	90
Total softwoods	34,455	21,993	56,448	64,519	87,401	208,368
Aspen	39	79	118	—	4,051	4,169
Cottonwood¹	160	57	217	903	4,481	5,601
Total hardwoods	199	136	335	903	8,532	9,770
All species	34,654	22,129	56,783	65,422	95,933	218,138

<sup>1</sup>Includes paper birch.



**Table 59**—Annual mortality of sawtimber (Scribner rule) on timberland outside National Forests by species and owner group, Montana, 1988

Species	Owner group					Total
	Other public		Total other public	Forest industry	Nonindustrial private	
	State	Other				
----- Thousand board feet, Scribner rule -----						
Douglas-fir	5,178	1,050	6,228	5,363	11,773	23,364
Ponderosa pine	2,303	3,867	6,170	6,795	28,591	41,556
Western white pine	1,363	—	1,363	651	—	2,014
Lodgepole pine	10,631	12,687	23,318	24,868	20,018	68,204
Whitebark pine	3,458	—	3,458	94	2,104	5,656
Limber pine	—	—	—	5,498	139	5,637
Western larch	2,149	3	2,152	1,073	2,282	5,507
Grand fir	543	—	543	487	—	1,030
Subalpine fir	1,886	536	2,422	1,649	257	4,328
Engelmann spruce	1,627	3	1,630	7,442	7,015	16,087
Western hemlock	—	—	—	—	—	—
Western redcedar	78	—	78	—	—	78
Total softwoods	29,216	18,146	47,362	53,920	72,179	173,461
Aspen	31	64	95	—	3,371	3,466
Cottonwood <sup>1</sup>	113	49	162	803	3,843	4,808
Total hardwoods	144	113	257	803	7,214	8,274
All species	29,360	18,259	47,619	54,723	79,393	181,735

<sup>1</sup>Includes paper birch.

Table 60—Annual mortality of growing stock on timberland outside National Forests by species and diameter class, Montana, 1988

Species	Diameter class (inches at breast height)														All classes	
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+			
----- Thousand cubic feet -----																
Douglas-fir	1,057	1,398	675	1,121	625	848	574	519	209	106	514	27	202	7,875		
Ponderosa pine	1,388	3,306	3,198	2,955	2,114	1,015	777	370	131	300	197	139	158	16,048		
Western white pine	5	73	24	78	84	—	74	—	47	27	—	—	67	479		
Lodgepole pine	6,951	8,269	7,545	4,743	2,419	813	670	153	74	—	—	—	—	31,637		
Whitebark pine	81	182	107	393	278	127	50	45	124	68	30	—	—	1,485		
Limber pine	401	372	132	102	286	317	146	119	71	—	—	—	—	1,946		
Western larch	410	310	162	89	279	35	328	131	43	81	77	—	—	1,945		
Grand fir	—	214	73	58	17	57	—	37	—	—	—	—	—	456		
Subalpine fir	1,106	1,281	681	251	—	108	103	67	—	—	—	—	—	3,597		
Engelmann spruce	311	212	543	342	595	679	541	282	336	—	52	89	134	4,116		
Western hemlock	—	13	—	—	—	—	—	—	—	—	—	—	—	13		
Western redcedar	—	—	—	—	—	—	—	—	—	—	—	20	—	20		
Total softwoods	11,710	15,630	13,140	10,132	6,697	3,999	3,263	1,723	1,035	582	870	275	561	69,617		
Aspen	1,146	605	489	389	305	—	119	—	—	—	—	—	—	3,053		
Cottonwood <sup>1</sup>	—	—	46	138	98	188	238	25	116	79	98	—	204	1,230		
Total hardwoods	1,146	605	535	527	403	188	357	25	116	79	98	—	204	4,283		
All species	12,856	16,235	13,675	10,659	7,100	4,187	3,620	1,748	1,151	661	968	275	765	73,900		

<sup>1</sup>Includes paper birch.

**Table 61—Annual mortality of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and diameter class, Montana, 1988**

Species	Diameter class (inches at breast height)												All classes
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+		
----- Thousand board feet, International 1/4-inch rule -----													
Douglas-fir	2,389	5,249	3,154	4,568	3,298	2,986	1,205	620	3,120	182	1,405	28,176	
Ponderosa pine	9,785	12,561	10,479	5,282	4,536	2,150	901	1,953	1,269	942	1,178	51,036	
Western white pine	102	429	488	—	428	—	291	168	—	—	450	2,356	
Lodgepole pine	31,071	27,297	13,445	4,505	3,712	801	420	—	—	—	—	81,251	
Whitebark pine	426	2,314	1,709	693	262	231	636	353	165	—	—	6,789	
Limber pine	701	658	1,718	1,833	835	700	400	—	—	—	—	6,845	
Western larch	607	512	1,613	183	1,881	794	259	459	438	—	—	6,746	
Grand fir	355	295	97	322	—	182	—	—	—	—	—	1,251	
Subalpine fir	2,410	1,323	—	570	551	351	—	—	—	—	—	5,205	
Engelmann spruce	2,042	1,879	3,239	3,647	2,873	1,481	1,797	—	301	528	837	18,624	
Western hemlock	—	—	—	—	—	—	—	—	—	—	—	—	
Western redcedar	—	—	—	—	—	—	—	—	—	90	—	90	
Total softwoods	49,888	52,517	35,942	21,603	18,376	9,676	5,909	3,553	5,293	1,742	3,870	208,369	
Aspen	XXXXX <sup>1</sup>	2,010	1,578	—	581	—	—	—	—	—	—	4,169	
Cottonwood <sup>2</sup>	XXXXX	684	496	925	1,125	115	530	336	445	—	944	5,600	
Total hardwoods	XXXXX	2,694	2,074	925	1,706	115	530	336	445	—	944	9,769	
All species	49,888	55,211	38,016	22,528	20,082	9,791	6,439	3,889	5,738	1,742	4,814	218,138	

<sup>1</sup>Hardwoods are not considered sawtimber until they are 11 inches d.b.h.

<sup>2</sup>Includes paper birch.



Table 62—Annual mortality of sawtimber (Scribner rule) on timberland outside National Forests by species and diameter class, Montana, 1988

Species	Diameter class (inches at breast height)												All classes
	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+		
----- Thousand board feet, Scribner rule -----													
Douglas-fir	1,645	4,079	2,550	3,843	2,829	2,604	1,073	552	2,776	162	1,251	23,364	
Ponderosa pine	7,256	10,239	8,602	4,363	3,799	1,803	776	1,708	1,121	838	1,049	41,554	
Western white pine	79	342	408	—	380	—	256	149	—	—	400	2,014	
Lodgepole pine	26,066	22,396	11,502	3,913	3,241	713	373	—	—	—	—	68,204	
Whitebark pine	346	1,874	1,367	605	231	206	566	314	147	—	—	5,656	
Limber pine	496	483	1,415	1,563	721	604	355	—	—	—	—	5,637	
Western larch	455	330	1,247	157	1,609	684	227	408	390	—	—	5,507	
Grand fir	273	235	83	277	—	162	—	—	—	—	—	1,030	
Subalpine fir	1,955	1,087	—	492	488	307	—	—	—	—	—	4,329	
Engelmann spruce	1,727	1,578	2,747	3,150	2,507	1,297	1,599	—	268	470	745	16,088	
Western hemlock	—	—	—	—	—	—	—	—	—	—	—	—	
Western redcedar	—	—	—	—	—	—	—	—	—	78	—	78	
Total softwoods	40,298	42,643	29,921	18,363	15,805	8,380	5,225	3,131	4,702	1,548	3,445	173,461	
Aspen	XXXXX <sup>1</sup>	1,629	1,333	—	504	—	—	—	—	—	—	3,466	
Cottonwood <sup>2</sup>	XXXXX	527	421	790	978	101	471	285	395	—	840	4,808	
Total hardwoods	XXXXX	2,156	1,754	790	1,482	101	471	285	395	—	840	8,274	
All species	40,298	44,799	31,675	19,153	17,287	8,481	5,696	3,416	5,097	1,548	4,285	181,735	

<sup>1</sup>Hardwoods are not considered sawtimber until they are 11 inches d.b.h.

<sup>2</sup>Includes paper birch.

**Table 63**—Annual mortality of growing stock on timberland outside National Forests by species and cause of death, Montana, 1988

Species	Cause of death								Total
	Insects	Disease	Fire	Animal	Weather	Suppression	Unknown <sup>1</sup>	Logging	
	----- <i>Thousand cubic feet</i> -----								
Douglas-fir	1,468	2,257	606	—	889	—	2,527	128	7,875
Ponderosa pine	2,293	762	10,081	15	555	70	2,130	141	16,047
Western white pine	47	215	—	—	107	—	110	—	479
Lodgepole pine	16,047	4,026	1,396	123	1,601	83	8,008	353	31,637
Whitebark pine	127	399	—	—	18	—	941	—	1,485
Limber pine	48	149	—	76	46	21	1,606	—	1,946
Western larch	655	521	—	—	294	13	328	135	1,946
Grand fir	43	295	—	—	—	—	61	56	455
Subalpine fir	95	481	139	28	378	93	2,193	190	3,597
Engelmann spruce	619	593	744	—	1,656	—	505	—	4,117
Western hemlock	—	—	—	—	13	—	—	—	13
Western redcedar	—	20	—	—	—	—	—	—	20
Total softwoods	21,442	9,718	12,966	242	5,557	280	18,409	1,003	69,617
Aspen	—	1,819	35	—	205	—	955	40	3,054
Cottonwood <sup>2</sup>	—	629	—	259	31	—	310	—	1,229
Total hardwoods	—	2,448	35	259	236	—	1,265	40	4,283
All species	21,442	12,166	13,001	501	5,793	280	19,674	1,043	73,900

<sup>1</sup>Because many destructive agents may attack trees in concert or in succession, determining the actual causal agent is often difficult. When the primary cause of death cannot be precisely determined, it is listed as unknown.

<sup>2</sup>Includes paper birch.

**Table 64—Annual mortality of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and cause of death, Montana, 1988**

Species	Cause of death							Total
	Insects	Disease	Fire	Animal	Weather	Suppression	Unknown <sup>1</sup>	
	----- Thousand board feet, International 1/4-inch rule -----							
Douglas-fir	6,052	8,964	1,429	—	3,106	—	8,396	28,176
Ponderosa pine	9,607	3,017	27,018	—	2,654	—	8,214	51,037
Western white pine	278	1,198	—	—	633	—	246	2,355
Lodgepole pine	33,943	10,585	3,840	—	4,719	—	27,472	81,252
Whitebark pine	686	1,665	—	—	102	—	4,335	6,788
Limber pine	—	—	—	—	—	—	6,845	6,845
Western larch	1,794	1,962	—	—	1,384	—	1,202	6,746
Grand fir	220	601	—	—	—	—	157	1,251
Subalpine fir	266	1,418	—	—	750	—	1,986	5,206
Engelmann spruce	3,082	2,193	3,595	—	7,505	—	2,249	18,624
Western hemlock	—	—	—	—	—	—	—	—
Western redcedar	—	90	—	—	—	—	—	90
Total softwoods	55,928	31,693	35,882	—	20,853	—	61,102	208,370
Aspen	—	2,982	176	—	262	—	748	4,168
Cottonwood <sup>2</sup>	—	2,741	—	1,251	143	—	1,465	5,600
Total hardwoods	—	5,723	176	1,251	405	—	2,213	9,768
All species	55,928	37,416	36,058	1,251	21,258	—	63,315	218,138

<sup>1</sup>Because many destructive agents may attack trees in concert or in succession, determining the actual causal agent is often difficult. When the primary cause of death cannot be precisely determined, it is listed as unknown.

<sup>2</sup>Includes paper birch.



**Table 65**—Annual mortality of sawtimber (Scribner rule) on timberland outside National Forests by species and cause of death, Montana, 1988

Species	Cause of death						Total
	Insects	Disease	Fire	Animal	Weather	Suppression	
	----- Thousand board feet, Scribner rule -----						
Douglas-fir	5,157	7,493	1,177	—	2,643	—	23,364
Ponderosa pine	7,730	2,374	21,893	—	2,167	—	41,555
Western white pine	245	1,026	—	—	523	—	2,013
Lodgepole pine	28,688	8,786	3,043	—	3,872	—	68,203
Whitebark pine	597	1,431	—	—	88	—	5,656
Limber pine	—	—	—	—	—	—	5,638
Western larch	1,546	1,558	—	—	1,083	—	5,506
Grand fir	177	522	—	—	—	—	1,031
Subalpine fir	206	1,214	—	—	656	—	4,329
Engelmann spruce	2,656	1,885	3,145	—	6,482	—	16,088
Western hemlock	—	—	—	—	—	—	—
Western redcedar	—	78	—	—	—	—	78
Total softwoods	47,002	26,367	29,258	—	17,514	—	173,461
Aspen	—	2,483	132	—	222	—	3,466
Cottonwood <sup>2</sup>	—	2,352	—	1,087	87	—	4,808
Total hardwoods	—	4,835	132	1,087	309	—	8,274
All species	47,002	31,202	29,390	1,087	17,823	—	181,735

<sup>1</sup>Because many destructive agents may attack trees in concert or in succession, determining the actual causal agent is often difficult. When the primary cause of death cannot be precisely determined, it is listed as unknown.

<sup>2</sup>Includes paper birch.

## County Tables

**Table 66**—Area of timberland outside National Forests by county,  
Montana, 1989

County	Area	County	Area
	<i>Acres</i>		<i>Acres</i>
Beaverhead	130,848	Meagher	170,679
Big Horn	228,656	Mineral	109,684
Blaine	107,558	Missoula	725,679
Broadwater	56,416	Musselshell	243,485
Carbon	42,487	Park	136,041
Carter	39,234	Petroleum	69,112
Cascade	130,355	Phillips	98,841
Chouteau	72,364	Pondera	22,412
Custer	104,269	Powder River	104,843
Daniels	5,407	Powell	356,587
Dawson	16,532	Prairie	8,273
Deer Lodge	93,893	Ravalli	152,318
Fallon	9,063	Richland	17,759
Fergus	262,819	Roosevelt	15,543
Flathead	592,063	Rosebud	230,754
Gallatin	175,191	Sanders	516,672
Garfield	100,261	Sheridan	6,313
Glacier	121,325	Silver Bow	67,880
Golden Valley	39,685	Stillwater	68,316
Granite	192,021	Sweet Grass	88,682
Hill	32,608	Teton	46,378
Jefferson	135,875	Toole	11,631
Judith Basin	32,663	Treasure	44,072
Lake	318,367	Valley	36,865
Lewis and Clark	374,841	Wheatland	23,572
Liberty	9,880	Wibaux	6,101
Lincoln	488,310	Yellowstone	120,625
McCone	13,253		
Madison	199,920	Total	7,625,281

**Table 67**—Net volume of growing stock and sawtimber on timberland outside  
National Forests by county, Montana, 1989

County	Growing stock	Sawtimber	
		<i>Thousand board feet International 1/4-inch rule</i>	<i>Thousand board feet Scribner rule</i>
Beaverhead	259,298	936,650	784,760
Big Horn	176,351	684,446	566,841
Blaine	111,653	365,817	302,368
Broadwater	53,388	243,728	204,215
Carbon	57,338	229,950	190,993
Carter	22,228	83,274	69,217
Cascade	184,218	724,174	590,990
Chouteau	75,348	188,846	153,775
Custer	59,038	213,430	177,188
Daniels	2,620	9,093	7,568
Dawson	7,714	28,639	23,920
Deer Lodge	128,926	401,213	329,322
Fallon	4,746	17,145	14,268
Fergus	319,999	1,064,830	881,945
Flathead	937,830	3,356,558	2,793,955
Gallatin	245,512	1,074,107	898,719
Garfield	49,285	164,774	135,125
Glacier	184,844	605,758	504,156
Golden Valley	25,729	88,929	72,755
Granite	275,001	1,023,683	847,319
Hill	57,251	187,117	155,962
Jefferson	135,727	472,992	371,661
Judith Basin	45,161	174,912	142,677
Lake	548,745	2,263,703	1,901,560
Lewis and Clark	387,058	1,374,200	1,106,359
Liberty	5,812	13,800	11,101
Lincoln	731,552	2,731,235	2,298,513
McCone	6,115	21,685	18,101
Madison	286,355	1,062,052	877,246
Meagher	185,650	547,145	442,712
Mineral	144,217	407,893	338,170
Missoula	1,176,110	3,983,312	3,290,796
Musselshell	129,862	459,363	379,143
Park	259,462	983,809	808,893
Petroleum	33,665	111,275	90,960
Phillips	78,172	244,763	201,011
Pondera	13,848	30,502	24,284
Powder River	59,674	215,650	179,027
Powell	508,948	1,808,362	1,497,750
Prairie	4,113	15,009	12,495
Ravalli	223,058	986,079	822,070
Richland	8,002	29,796	24,929
Roosevelt	7,052	25,700	21,484
Rosebud	162,668	644,485	537,700
Sanders	741,999	2,708,904	2,246,770
Sheridan	3,055	10,587	8,811
Silver Bow	86,837	314,834	258,249
Stillwater	82,799	296,902	241,568
Sweet Grass	112,016	410,171	335,001
Teton	32,754	59,097	45,665
Toole	6,613	17,146	13,914
Treasure	25,660	94,666	78,840
Valley	18,180	62,267	51,408
Wheatland	22,813	87,078	72,497
Wibaux	3,225	12,566	10,454
Yellowstone	63,713	224,662	185,380
<b>Total</b>	<b>9,579,007</b>	<b>34,598,763</b>	<b>28,652,560</b>



**Table 68**—Net annual growth of growing stock and sawtimber on timberland outside National Forests by county, Montana, 1988

County	Growing stock	Sawtimber	
	<i>Thousand cubic feet</i>	<i>Thousand board feet International 1/4-inch rule</i>	<i>Thousand board feet Scribner rule</i>
Beaverhead	5,382	25,263	21,819
Big Horn	5,625	28,250	22,431
Blaine	3,149	12,548	10,084
Broadwater	1,087	7,113	6,242
Carbon	1,085	5,398	4,322
Carter	613	2,859	2,239
Cascade	3,777	17,876	14,864
Chouteau	2,397	4,877	4,175
Custer	1,602	7,819	6,026
Daniels	86	378	303
Dawson	201	845	651
Deer Lodge	2,664	12,209	10,771
Fallon	144	654	518
Fergus	8,330	35,900	29,050
Flathead	28,344	107,686	93,429
Gallatin	3,420	14,995	13,228
Garfield	640	3,460	2,649
Glacier	4,302	11,882	10,703
Golden Valley	848	3,631	2,796
Granite	4,564	26,149	22,798
Hill	1,586	5,162	4,395
Jefferson	3,702	17,754	14,654
Judith Basin	939	4,422	3,657
Lake	12,815	50,292	43,946
Lewis and Clark	8,412	43,267	35,797
Liberty	206	512	411
Lincoln	15,993	61,767	55,119
McCone	179	771	603
Madison	374	1,828	1,077
Meagher	4,438	12,322	10,650
Mineral	4,288	18,123	15,406
Missoula	33,751	133,672	114,466
Musselshell	-392	6,209	4,696
Park	8	8,011	7,639
Petroleum	456	2,183	1,653
Phillips	2,631	8,622	6,802
Pondera	444	884	725
Powder River	1,610	7,905	6,082
Powell	12,778	48,497	41,405
Prairie	123	530	422
Ravalli	6,804	37,743	31,600
Richland	196	810	612
Roosevelt	187	787	605
Rosebud	4,693	25,393	20,182
Sanders	20,986	85,110	72,193
Sheridan	101	442	354
Silver Bow	2,263	7,895	6,784
Stillwater	2,159	8,952	7,238
Sweet Grass	2,766	11,783	9,513
Teton	1,251	1,837	1,459
Toole	229	644	517
Treasure	701	3,495	2,710
Valley	370	1,807	1,421
Wheatland	324	1,178	981
Wibaux	86	361	286
Yellowstone	13	3,440	2,624
Total	225,730	954,202	807,782

**Table 69**—Annual mortality of growing stock and sawtimber on timberland outside National Forests by county, Montana, 1988

County	Growing stock	Sawtimber	
	Thousand cubic feet	Thousand board feet International 1/4-inch rule	Thousand board feet Scribner rule
Beaverhead	475	846	725
Big Horn	730	2,606	2,167
Blaine	397	972	813
Broadwater	197	223	173
Carbon	317	634	480
Carter	111	465	394
Cascade	406	1,463	1,212
Chouteau	121	119	101
Custer	297	1,137	973
Daniels	4	15	12
Dawson	35	171	143
Deer Lodge	536	2,160	1,837
Fallon	15	61	51
Fergus	1,236	2,946	2,466
Flathead	10,685	26,412	22,045
Gallatin	1,992	8,303	6,953
Garfield	1,114	3,095	2,529
Glacier	1,571	3,239	2,538
Golden Valley	68	331	283
Granite	1,578	4,839	4,225
Hill	76	190	158
Jefferson	323	654	542
Judith Basin	117	352	292
Lake	3,057	11,700	9,942
Lewis and Clark	2,379	7,116	5,658
Liberty	12	16	13
Lincoln	11,593	31,426	26,417
McCone	17	80	67
Madison	5,721	24,261	20,462
Meagher	346	723	573
Mineral	801	3,569	3,034
Missoula	4,102	12,256	10,178
Musselshell	4,816	12,390	10,063
Park	4,387	13,536	10,994
Petroleum	756	2,153	1,762
Phillips	228	613	510
Pondera	52	99	83
Powder River	305	1,162	996
Powell	2,648	6,986	5,939
Prairie	13	62	51
Ravalli	678	2,279	1,922
Richland	40	199	167
Roosevelt	28	140	117
Rosebud	865	2,880	2,413
Sanders	4,857	13,163	11,045
Sheridan	4	17	14
Silver Bow	290	1,340	1,083
Stillwater	279	480	378
Sweet Grass	422	739	575
Teton	83	82	69
Toole	14	26	22
Treasure	127	473	406
Valley	265	750	612
Wheatland	131	476	414
Wibaux	17	85	71
Yellowstone	2,166	5,628	4,573
Total	73,900	218,138	181,735

### APPENDIX III: AREA OF NATIONAL FORESTS AND INDIAN RESERVATIONS

<b>National Forest (1988)</b>	<b>Acres</b>
Beaverhead	2,128,714
Bitterroot	1,115,548
Custer	1,112,388
Deerlodge	1,194,944
Flathead	2,353,037
Gallatin	1,736,117
Helena	976,722
Kootenai <sup>1</sup>	2,223,996
Lewis and Clark	1,843,665
Lolo	2,112,376
<b>Total</b>	<b>16,797,507</b>

<sup>1</sup>Includes 447,120 acres that were formerly part of the Kaniksu National Forest in Idaho.

<b>Indian Reservation (1989)</b>	<b>Acres</b>	
	<b>Forested</b>	<b>Reservation total</b>
Blackfeet	107,052	937,701
Crow	138,158	1,538,297
Flathead	435,585	627,793
Fort Belknap	27,421	639,375
Fort Peck	11,481	916,722
Northern Cheyenne	114,072	441,577
Rocky Boy	25,336	117,612
<b>Total</b>	<b>859,105</b>	<b>5,219,077</b>



## APPENDIX IV: RESERVED AREAS ADMINISTERED BY THE FOREST SERVICE AND THE NATIONAL PARK SERVICE

<b>Wilderness areas administered by the Forest Service (1988)</b>		<b>Acres</b>
Absaroka-Beartooth <sup>1</sup>		921,465
Anaconda-Pintler <sup>1</sup>		158,516
Bob Marshall		1,009,356
Cabinet Mountains		94,272
Gates of the Mountains		28,562
Great Bear		286,700
Lee Metcalf <sup>1</sup>		250,297
Mission Mountains		73,877
Rattlesnake <sup>1</sup>		33,000
Scapegoat <sup>1</sup>		239,936
Selway-Bitterroot		251,443
Welcome Creek		28,135
Total area		3,375,559

<sup>1</sup>These wilderness areas include reserved acres of State land.

<b>Reserved areas administered by the National Park Service (1988)</b>		<b>Acres</b>
Big Hole National Battleground		657
Bighorn Canyon National Recreation Area		31,602
Custer Battlefield National Monument		765
Glacier National Park		1,013,572
Grant-Kohrs Ranch National Historic Site		1,499
Yellowstone National Park (portion occurring in Montana)		167,672
Total area		1,215,767

## APPENDIX V: PRINCIPAL TREE SPECIES OF MONTANA

### Timber Species

#### Coniferous

Grand fir	<i>Abies grandis</i>
Subalpine fir	<i>A. lasiocarpa</i>
Subalpine larch	<i>Larix lyallii</i>
Western larch	<i>L. occidentalis</i>
Engelmann spruce	<i>Picea engelmannii</i>
White spruce	<i>P. glauca</i>
Whitebark pine	<i>Pinus albicaulis</i>
Lodgepole pine	<i>P. contorta</i> var. <i>latifolia</i>
Limber pine	<i>P. flexilis</i>
Western white pine	<i>P. monticola</i>
Ponderosa pine	<i>P. ponderosa</i>
	<i>P. ponderosa</i> var. <i>scopulorum</i>
Douglas-fir	<i>Pseudotsuga menziesii</i> var. <i>glauca</i>
Western redcedar	<i>Thuja plicata</i>
Western hemlock	<i>Tsuga heterophylla</i>
Mountain hemlock	<i>T. mertensiana</i>

#### Deciduous

Paper birch	<i>Betula papyrifera</i>
Eastern cottonwood	<i>Populus deltoides</i>
Quaking aspen	<i>P. tremuloides</i>
Black cottonwood	<i>P. trichocarpa</i>

### Woodland Species

#### Coniferous

Utah juniper	<i>Juniperus osteosperma</i>
Rocky Mountain juniper	<i>J. scopulorum</i>

#### Deciduous

Rocky Mountain maple	<i>Acer glabrum</i>
Curlleaf mountain mahogany	<i>Cercocarpus ledifolius</i>



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Conner, Roger C.; O'Brien, Renee A. 1993. Montana's Forest Resources. Resour. Bull.  
INT-81. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain  
Research Station. 96 p.

Presents highlights of the forest resource in Montana as of 1989. Describes the extent, condition, and location of the State's forests with particular emphasis on timberland. Includes statistical tables: area by land classes, ownership, and forest type; growing-stock and sawtimber volumes, growth, mortality, and removals for timberland.

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KEYWORDS: timberland area, stand-size classes, biological productivity, harvest activity, habitat types, forest inventories, volume

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